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TRAFFIC IMPACT STUDY

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Boston College
Newton Campus
Newton, Massachusetts

May 1989

Vanasse Hangen Brustlin, Inc.



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BOSTON COLLEGE NEWTON CAMPUS.

Newton, Massachusetts

Prepared for Boston College
Newton, Massachusetts

Prepared by Vanasse Hangen Brustlin, Inc.
Consulting Engineers & Planners
60 Birmingham Parkway
Boston, MA 02135

May 1989

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EXECUTIVE SUMMARY

This study has been conducted to determine the traffic impact of potential development on the Boston College Newton Campus located off Centre Street in Newton, Massachusetts. This study was undertaken to satisfy an agreement between Boston College and the Newton Planning and Development Board. As outlined in the Board's discussion of May, 1988, this study analyzes the traffic impact of a 500-bed dormitory if development were to occur. The study also addresses possible measures to improve traffic flow in the area. A design year of 1992 was chosen based on an estimate of the earliest possible date of occupancy if construction was planned.

GENERAL

Development on the Boston College Newton Campus is in the earliest stages of consideration. If a 500-bed dormitory is constructed it will have little or no impact on the surrounding street system.

EXISTING CONDITIONS

The highest volumes in the study area are found on Centre Street which carries 24,000 to 25,000 vehicles per day. Approximately 8 percent occur during the peak hour. The lowest volumes are found on Blake Street which carries 415 vehicles per day.

A review of accident data between January, 1987 and December, 1988 revealed that the majority of accidents occurred along Centre Street. Of these accidents none were reported as occurring at the Boston College main driveway.

BACKGROUND TRAFFIC GROWTH

Based on information provided by city of Newton officials, a 2 percent annual growth factor was applied to the existing through traffic along Centre and Cabot Streets to project the 1992 horizon year traffic conditions.

SITE TRAFFIC

Site traffic was generated based on the potential development of a 500-bed dormitory on the site. Based on ITE trip generation rates and a net student increase of 250 students, the development could produce 45 vehicle trips (40 entering, 5 exiting) during the morning peak hour and 30 vehicle trip (10 entering, 20 exiting) during the evening peak hour.

Based on existing traffic patterns approximately 30 percent of the site-generated traffic will be oriented to/from the north and 55 percent to/from the south along Centre Street. The remaining 15 percent is dispersed evenly among Cotton Street, Cabot Street and Mill Street.

PARKING

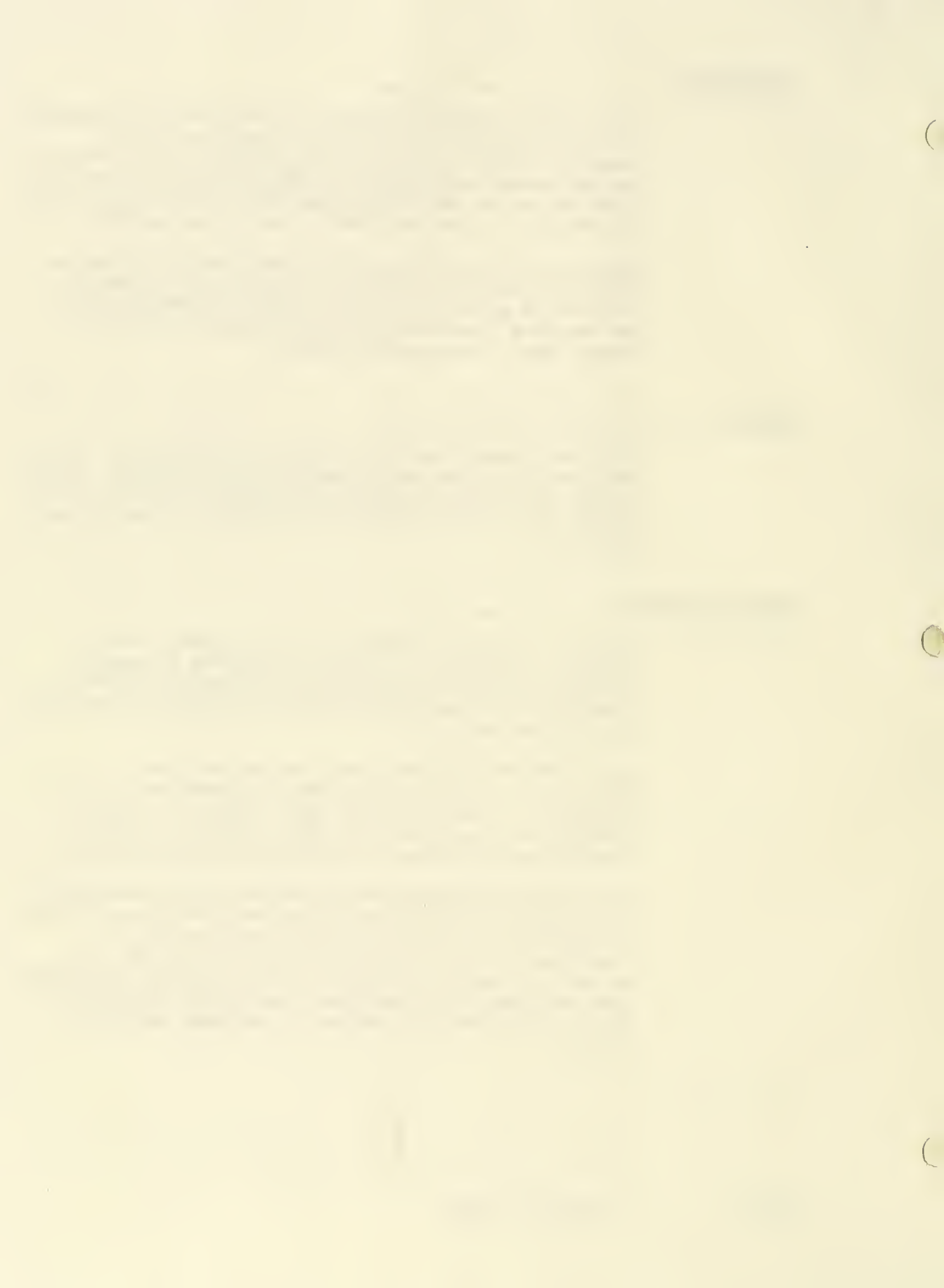
It is anticipated that if the dormitory is constructed an additional 93 to 162 parking spaces will be required. Boston College will adhere to parking requirements set forth by the city of Newton Zoning Ordinance with regard to quantity and location.

TRAFFIC OPERATIONS

Roadway link analysis reveals that Centre Street will continue to operate at as much as 87 percent of capacity (level-of-service E) under both 1992 No-Build and Build conditions. The remaining streets will operate at level-of-service B or greater.

Under 1992 No-Build conditions, the unsignalized intersections along Centre Street will experience little or no change in level of service when compared to existing levels of service. Under 1992 Build conditions levels of service remain the same as under 1992 No-Build conditions.

The signalized intersections of Centre Street, Cabot Street and Sargent Street will operate at level-of-service F during the PM peak hour under both 1992 No-Build and Build conditions. The intersection of Centre Street and Ward Street will operate at level-of-service E during the evening peak hour under both conditions. During the AM peak hour both intersections will operate at desirable levels of service.



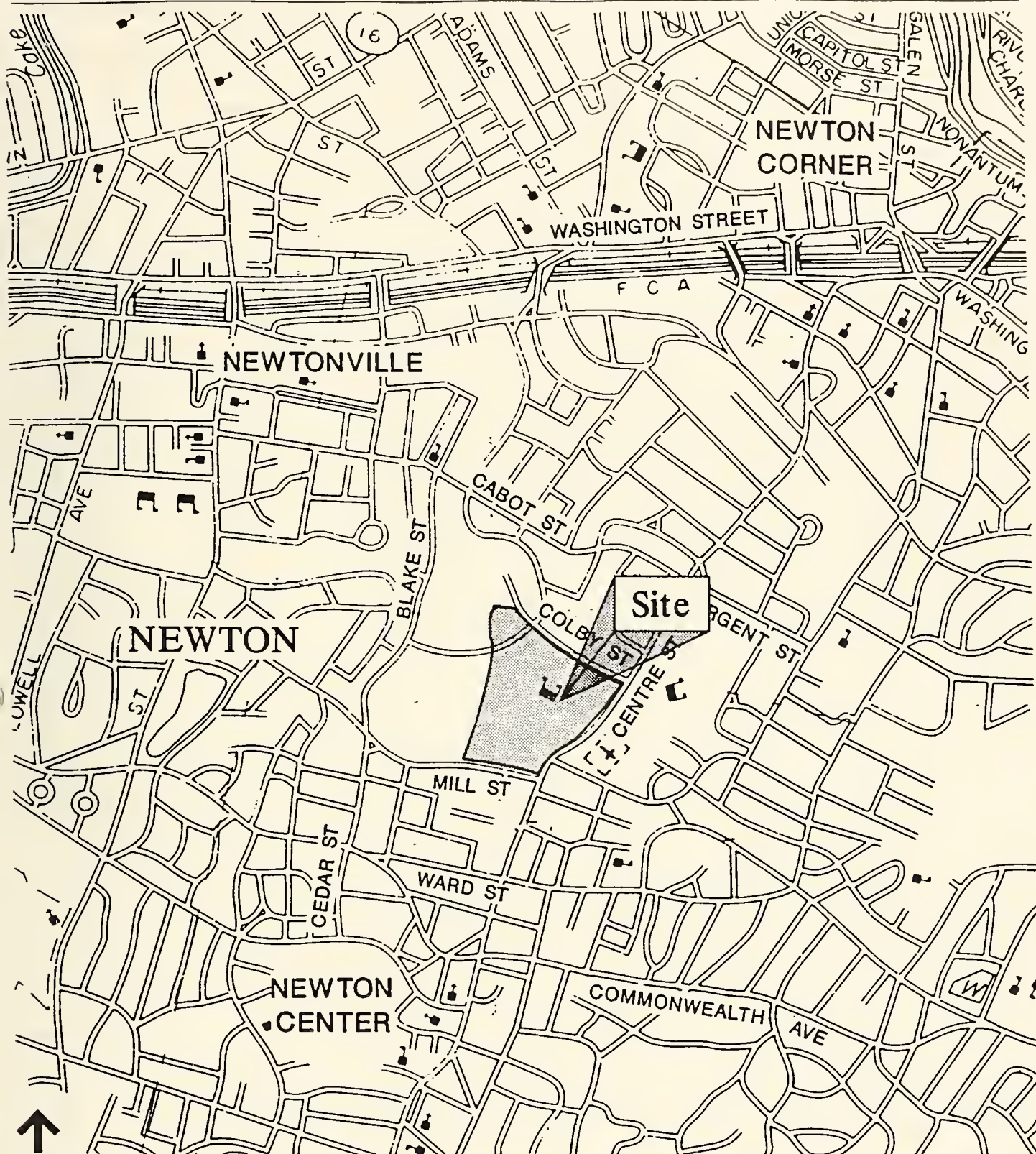
ALTERNATIVES ANALYSIS

Several improvements which could enhance traffic flow along Centre Street were analyzed. They include:

- Widening Centre Street to four-lanes.
- Realignment and signalization of the intersections of the Boston College Main driveway and Centre Street and Cotton Street and Centre Street.
- Installing a left-turn-only line on northbound Centre Street at the Boston College Main driveway.
- Improving sight-distance on the southeastern corner of Centre Street and Cotton Street.
- Opening the existing entrance to the Boston College Newton Campus on Mill Street.

CONCLUSIONS/RECOMMENDATIONS

- Although no commitment has been made to development, the traffic impact of a 500-bed dormitory would be negligible.
- VHB recommends the installation of a left-turn lane on Centre Street at the Boston College main driveway by restriping Centre Street.
- Shrubbery and trees should also be trimmed to enhance sight distance on the southeast corner of Cotton Street.
- The Boston College driveway on Mill Street could be opened with only a minimum increase in traffic on Mill Street.



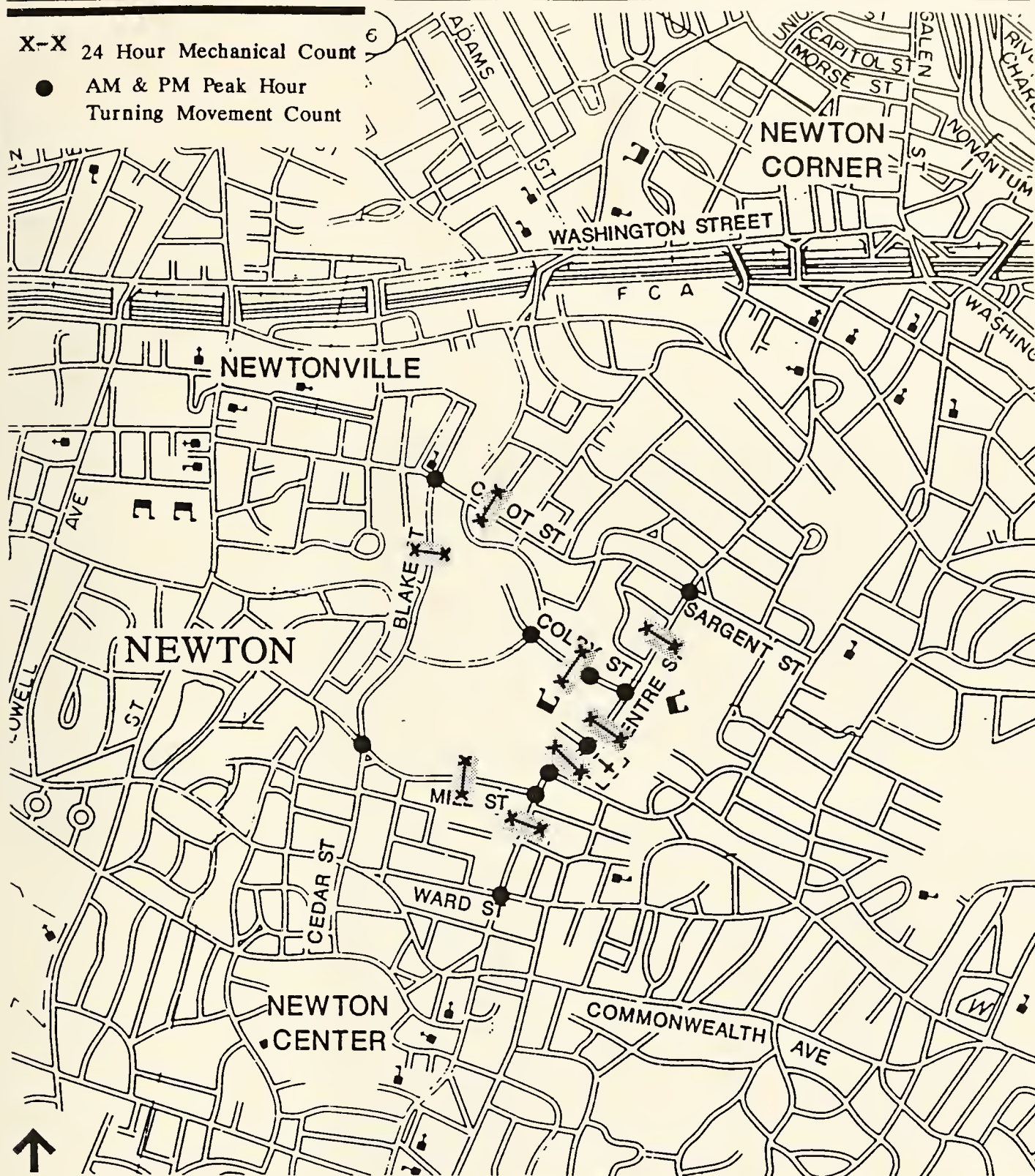
Vanasse Hangen Brustlin, Inc.

Site Location Map

Figure 1

X-X 24 Hour Mechanical Count

● AM & PM Peak Hour
Turning Movement Count



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Data Collection Map

Figure 2

INTRODUCTION

Boston College retained Vanasse Hangen Brustlin, Inc. (VHB) to conduct a traffic study for the Boston College Newton Campus in Newton, Massachusetts. A subdivision approval was granted on May 27, 1989 (date recorded) to Boston College for the Newton campus by the Newton Planning Board. As part of the approval, Boston College agreed to perform a traffic study within one year. As outlined by the Newton Planning Board in their decision, this study assesses the impact of potential future development of the Newton campus site on the surrounding street system. The study must also analyze potential geometric improvements in the area that could enhance traffic operations. These elements, along with a brief discussion on the future parking needs associated with potential development on the Newton campus, are discussed in this report.

The Boston College Newton campus is situated along Centre Street in Newton, Massachusetts, approximately one mile from the main Boston College campus. The Newton campus is bounded by Centre, Colby, Blake, and Mill streets as shown in Figure 1. The campus is comprised of classroom and administrative facilities, dormitories, an infirmary, a chapel, a gymnasium, and recreation fields with surface parking provided at various locations on campus. The campus supports 800 graduate law school students, the majority of whom commute to the campus. An additional 800 undergraduate students are housed in dormitories on the campus. Generally, the undergraduate students do not own cars and commute to the main Boston College campus by shuttle bus, bicycle, public transit, or walking. In addition to students enrolled in the law school or living on campus, administrative staff, faculty, and visitors travel to and from the campus daily.

FIELD INVENTORY

A comprehensive field inventory of the site area was conducted during April and May 1989. The inventory consists of roadway geometry, traffic volume, and speed and safety data within the study area. The data was collected in the following manner:

- Automatic traffic recorder counts were conducted for a minimum of twenty-four hours at the following locations:
 - Centre Street between Cabot Street and Colby Street
 - Centre Street between Colby Street and Boston College Newton campus main driveway
 - Centre Street between Cotton Street and Boston College Newton campus main driveway
 - Centre Street between Cotton Street and Ward Street
 - Colby Street between Rochester Road and Centre Street
 - Cabot Street between Centre Street and Blake Street
 - Blake Street between Cabot Street and Mill Street
- Manual turning movement counts were conducted at the following intersections during the morning and evening peak hours:
 - Centre Street and Cabot Street
 - Centre Street and Cotton Street
 - Centre Street and Boston College Newton Campus main driveway

- Centre Street and Colby Street
- Centre Street and Mill Street
- Centre Street and Ward Street
- Colby Street and Rochester Road
- Colby Street and Boston College Newton campus main driveway
- Blake Street and Cabot Street
- Blake Street and Mill Street
- Accident data for the study area roadways were obtained from the Newton Police Department for the most recent complete two-year period. (January, 1987 to December, 1988).

EXISTING CONDITIONS

The study area is defined by the roadways surrounding the campus which include Centre, Cabot, Blake, and Mill streets (Figure 3). The study area also extends south along Centre Street to Ward Street. The Boston College Newton campus is located off of Centre Street approximately two miles north of Newton Center.

ROADWAY GEOMETRICS

Centre Street

Centre Street is the major roadway within the study area. Classified as a primary collector, Centre Street runs north and south connecting residential neighborhoods and business areas in Newton with major arterials such as Route 9 and Commonwealth Avenue with the Massachusetts Turnpike (I-90). Within the study area, Centre Street is a two-lane roadway with curbs and gutters. The trees and utility poles along the edge of the roadway are generally 1- to 4-feet from the curb. Land use abutting Centre Street within the study area is predominately residential. In addition to Boston College Newton campus, Centre Street also provides access to the Newton Country Day School and Mount Alvernia High School.

Colby Street

Colby Street is a two-lane, private way owned by Boston College which runs east/west connecting Centre Street and Rochester Road. Colby Street provides access to the northern side of the Newton campus as well as several residences. An undeveloped portion of Colby Street extends through Lot 3 and Edmunds Park terminating at Blake Street.

TABLE 1
TRAFFIC VOLUME SUMMARY*

Location	Direction	Morning Peak**	"K" Factor***	Evening Peak+	"K" Factor**	Average Daily Traffic*
Centre Street north of Ward Street	Northbound	1,015		860		12,385
	Southbound	765	7.3%	1,000		12,035
	TOTAL	1,780		1,860	7.6%	24,420
Centre Street north of Mill Street	Northbound	1,050		815		12,320
	Southbound	825	7.4	1,140		12,970
	TOTAL	1,875		1,955	7.7	25,290
Centre Street south of Colby Street	Northbound	930		730		11,400
	Southbound	832	7.3	1,145		12,820
	TOTAL	1,765		1,875	7.7	24,220
Centre Street south of Cabot Street	Northbound	950		780		11,400
	Southbound	860	7.5	1,125		12,830
	TOTAL	1,810		1,905	7.9	24,230
Cabot Street west of Centre Street	Eastbound	270		165		2,015
	Westbound	105	10.3	150		1,625
	TOTAL	375		315	8.7	3,640
Colby Street west of Centre Street	Eastbound	55		25		380
	Westbound	15	10.1	35		315
	TOTAL	70		60	8.6	695
Mill Street west of Centre Street	Eastbound	125		75		970
	Westbound	55	9.8	115		865
	TOTAL	180		190	10.3	1,835
Blake Street south of Cabot Street	Northbound	25		20		200
	Southbound	20	10.8	25		215
	TOTAL	45		45	10.8	415

* Automatic traffic recorder (ATR) counts performed by VHB in April and May 1989.

** Generally between 7:45 and 8:45 AM. Expressed in vehicles per hour.

*** Percent of daily traffic occurring during the peak hour.

+ Generally between 5:00 and 6:00 PM. Expressed in vehicles per hour.

the south is restricted primarily by overhanging shrubbery and a wall on the southeast corner of the intersection. The horizontal alignment of Centre Street also restricts sight distance.

Centre Street and Mill Street

Centre Street and Mill Street form a T-type intersection. Pavement markings include a STOP bar and crosswalk on the Mill Street approach. Mill Street is divided by a double yellow centerline and has a single lane approach. The intersection is controlled by a STOP sign on the Mill Street approach.

Centre Street and Ward Street

Centre Street and Ward Street form a four-way intersection. A STOP bar is affixed in the eastbound approach. Double yellow centerlines are present on the three remaining approaches. The intersection is signalized.

Colby Street, Rochester Road, and Academy Way

At the four-way intersection of Colby Street, Rochester Road, and Academy Way, all approaches are single lane. There are no pavement markings or traffic control. The southern approach (Colby Street) is a gravel road. Access is restricted by a gate.

Blake Street, Cedar Street, and Mill Street

Blake Street, Cedar Street, and Mill Street form a four-way intersection. Cedar Street is approximately 23-feet wide with right and left turns channelized by a median. A STOP bar is present at this approach. Mill Street has two-lanes separated by a double yellow centerline. Blake Street has no pavement markings. The Cedar Street approach is STOP sign controlled. The remaining approaches have no traffic control.

Cabot Street, Blake Street, and Parkview Avenue

Cabot Street forms a four-way intersection with Parkview Avenue and Blake Street. The intersection has no traffic control, but has crosswalks at the Parkview approach and both legs of Cabot Street.

the south is restricted primarily by overhanging shrubbery and a wall on the southeast corner of the intersection. The horizontal alignment of Centre Street also restricts sight distance.

Centre Street and Mill Street

Centre Street and Mill Street form a T-type intersection. Pavement markings include a STOP bar and crosswalk on the Mill Street approach. Mill Street is divided by a double yellow centerline and has a single lane approach. The intersection is controlled by a STOP sign on the Mill Street approach.

Centre Street and Ward Street

Centre Street and Ward Street form a four-way intersection. A STOP bar is afixed in the eastbound approach. Double yellow centerlines are present on the three remaining approaches. The intersection is signalized.

Colby Street, Rochester Road, and Academy Way

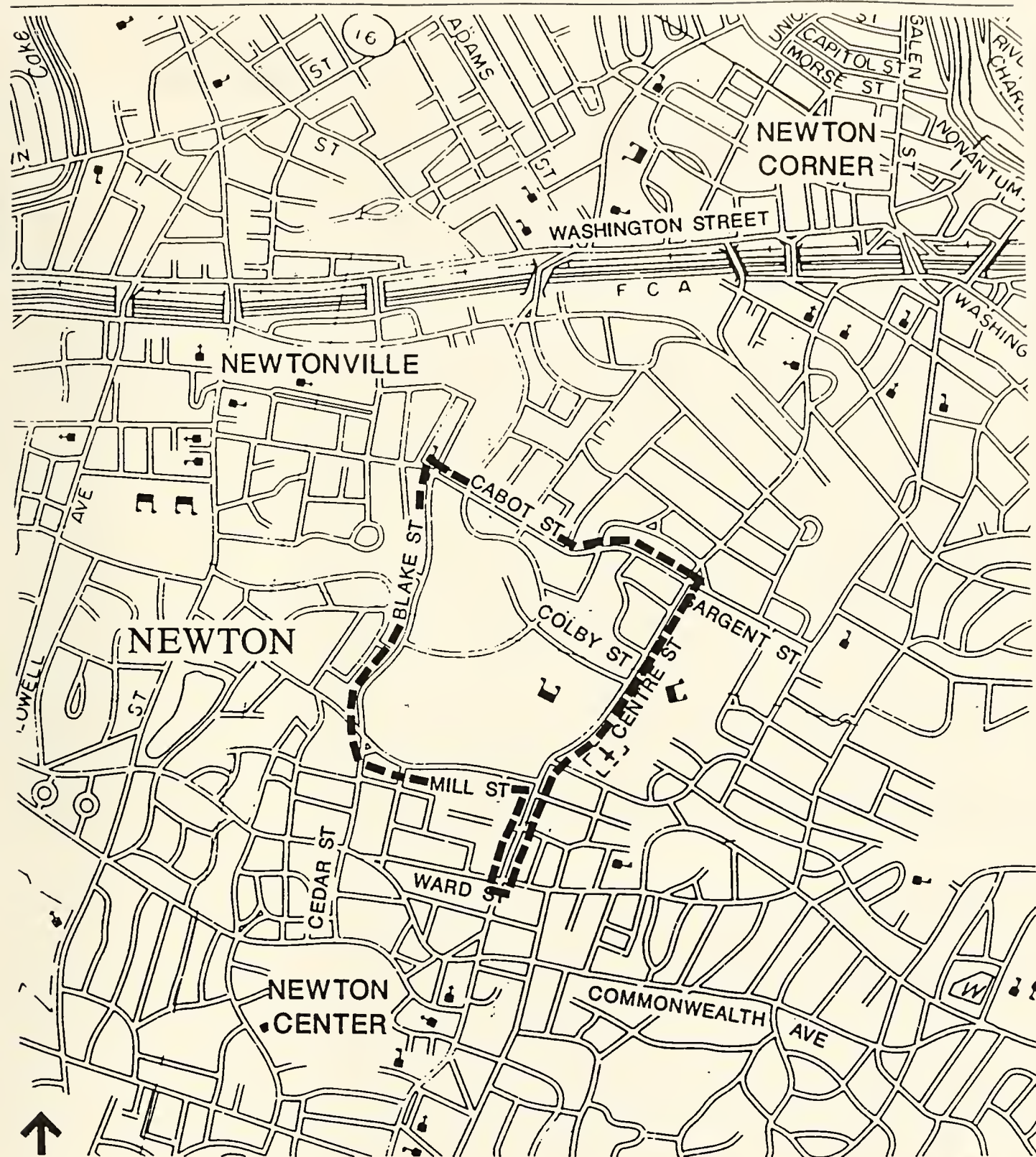
At the four-way intersection of Colby Street, Rochester Road, and Academy Way, all approaches are single lane. There are no pavement markings or traffic control. The southern approach (Colby Street) is a gravel road. Access is restricted by a gate.

Blake Street, Cedar Street, and Mill Street

Blake Street, Cedar Street, and Mill Street form a four-way intersection. Cedar Street is approximately 23-feet wide with right and left turns channelized by a median. A STOP bar is present at this approach. Mill Street has two-lanes separated by a double yellow centerline. Blake Street has no pavement markings. The Cedar Street approach is STOP sign controlled. The remaining approaches have no traffic control.

Cabot Street, Blake Street, and Parkview Avenue

Cabot Street forms a four-way intersection with Parkview Avenue and Blake Street. The intersection has no traffic control, but has crosswalks at the Parkview approach and both legs of Cabot Street.



Vanasse Hangen Brustlin, Inc.

Study Area Map

Figure 3

OBSERVED TRAFFIC VOLUMES

Vanasse Hangen Brustlin, Inc. conducted 24-hour automatic traffic recorder counts on the study area roadways and peak period (7:00 to 9:00 in the morning and 4:00 to 6:00 in the afternoon) turning movement and classification counts on the study area intersections. Table 1 presents the results of the traffic count program. The daily traffic flows are presented in Figure 4 and the morning and evening peak-hour traffic volumes are illustrated in Figures 5 and 6, respectively.

As shown in the table, the highest volumes in the study area were measured along Centre Street. Centre Street has an average daily traffic (ADT) ranging from 24,000 to 25,000 vehicles per day. These volumes are characterized by a high percentage of through traffic traveling to and from the region's major arterials (i.e., I-90, Commonwealth Avenue, and Route 9). Considerably lower volumes were recorded on the remaining streets within the study area. The lowest daily traffic volumes were recorded on Blake Street south of Cabot Street, which carries 415 vehicles per day. Typically, the morning and evening peak-hour volumes represent approximately 7.5 percent of the daily traffic on Centre Street and 8 to 11 percent on the remaining streets.

A distinct directionality of traffic flow is evident based on the data in Table 1. In the morning, northbound volumes on Centre Street are higher reflecting commuter traffic destined for the Massachusetts Turnpike (I-90). The reverse is true during the evening peak hour. On the remaining streets within the study area, the peak direction of flow is directed to and from Centre Street during the morning and evening peak hours, respectively.

Traffic operations along Centre Street were observed during both the morning and evening peak hours. During both peak periods, significant queuing along Centre Street was observed. In the morning, vehicle queuing was observed along northbound Centre Street stretching from the intersection of Centre Street and Cabot Street to Cotton Street. This condition, however, was only observed once. Normally, queuing at the Centre Street and Cabot Street signal ranged from ten to fifteen vehicles and dissipated quickly. In the evening, the southbound approach of Centre Street and Ward Street queued past the Boston College Newton campus main driveway extending Colby Street. The queue sustained for several minutes. Queuing on the side street generally did not exceed five to six vehicles. During the evening peak hour, vehicles exiting the Boston College Newton campus at the main driveway experienced considerable delays which resulted in queuing into the campus. This apparently is the result of congestion along Centre Street and the absence of acceptable gaps in the main stream traffic flow.

Cabot Street

Cabot Street within the study area runs east/west from its intersection with Blake Street and Parkview Avenue to Centre Street. Cabot Street is a two-lane, local street separated by a double yellow centerline. Land use along Cabot Street is mainly residential.

Blake Street

Blake Street is a residential street which marks the western boundary of the study area. Blake Street runs north/south, connecting Cabot Street and Mill Street. Blake Street is approximately 24-feet wide with no pavement markings. A section of Blake Street adjacent to Edmunds Park is in disrepair and appears to be unmaintained.

Centre Street, Cabot Street, and Sargent Street

The junction of Centre Street, Cabot Street, and Sargent Street creates a four-way intersection. Centre Street at the intersection slopes upward from north to south. Right turns onto Centre Street from Sargent Street are channelized by a large, landscaped "pork chop" island. Southbound left turns from Centre Street onto Sargent Street also use this route. A residential driveway is located on the southeast corner of the intersection. All four approaches to the intersection consist of a single lane. The intersection is signalized.

Centre Street and Colby Street

Centre Street and Colby Street form a T-type intersection. Colby Street consists of two lanes divided by a grass median. There is no traffic control at this intersection.

Centre Street and Boston College Newton Campus Main Driveway

Centre Street intersects with the Boston College Newton campus main driveway to form a T-type intersection. The driveway is 18-feet wide with no pavement markings or control. This driveway serves as the primary access to and egress from the Boston College Newton campus.

Centre Street and Cotton Street

Centre Street and Cotton Street form a T-type intersection with the Boston College Newton campus main driveway a short distance to the north. The intersection is STOP sign controlled with a single lane approach. Sight distance to

TABLE 1
TRAFFIC VOLUME SUMMARY*

Location	Direction	Morning Peak**	"K" Factor***	Evening Peak+	"K" Factor**	Average Daily Traffic*
Centre Street north of Ward Street	Northbound Southbound TOTAL	1,015 765 1,780	7.3%	860 1,000 1,860	7.6%	12,385 12,035 24,420
Centre Street north of Mill Street	Northbound Southbound TOTAL	1,050 825 1,875	7.4	815 1,140 1,955	7.7	12,320 12,970 25,290
Centre Street south of Colby Street	Northbound Southbound TOTAL	930 832 1,765	7.3	730 1,145 1,875	7.7	11,400 12,820 24,220
Centre Street south of Cabot Street	Northbound Southbound TOTAL	950 860 1,810	7.5	780 1,125 1,905	7.9	11,400 12,830 24,230
Cabot Street west of Centre Street	Eastbound Westbound TOTAL	270 105 375	10.3	165 150 315	8.7	2,015 1,625 3,640
Colby Street west of Centre Street	Eastbound Westbound TOTAL	55 15 70	10.1	25 35 60	8.6	380 315 695
Mill Street west of Centre Street	Eastbound Westbound TOTAL	125 55 180	9.8	75 115 190	10.3	970 865 1,835
Blake Street south of Cabot Street	Northbound Southbound TOTAL	25 20 45	10.8	20 25 45	10.8	200 216 416

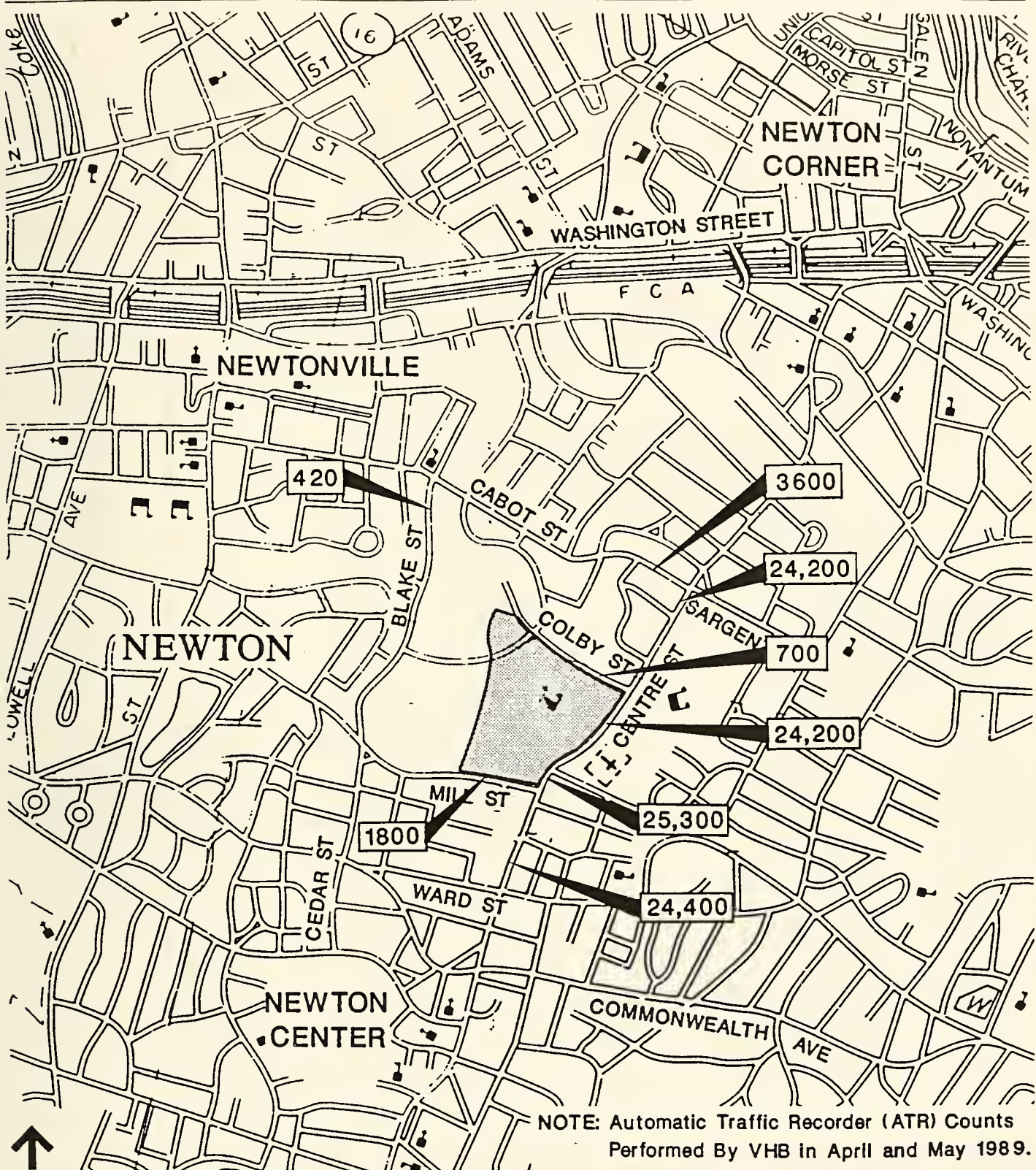
* Automatic traffic recorder (ATR) counts performed by VHB in April and May 1989.

** Generally between 7:45 and 8:45 AM. Expressed in vehicles per hour.

*** Percent of daily traffic occurring during the peak hour.

+ Generally between 5:00 and 6:00 PM. Expressed in vehicles per hour.

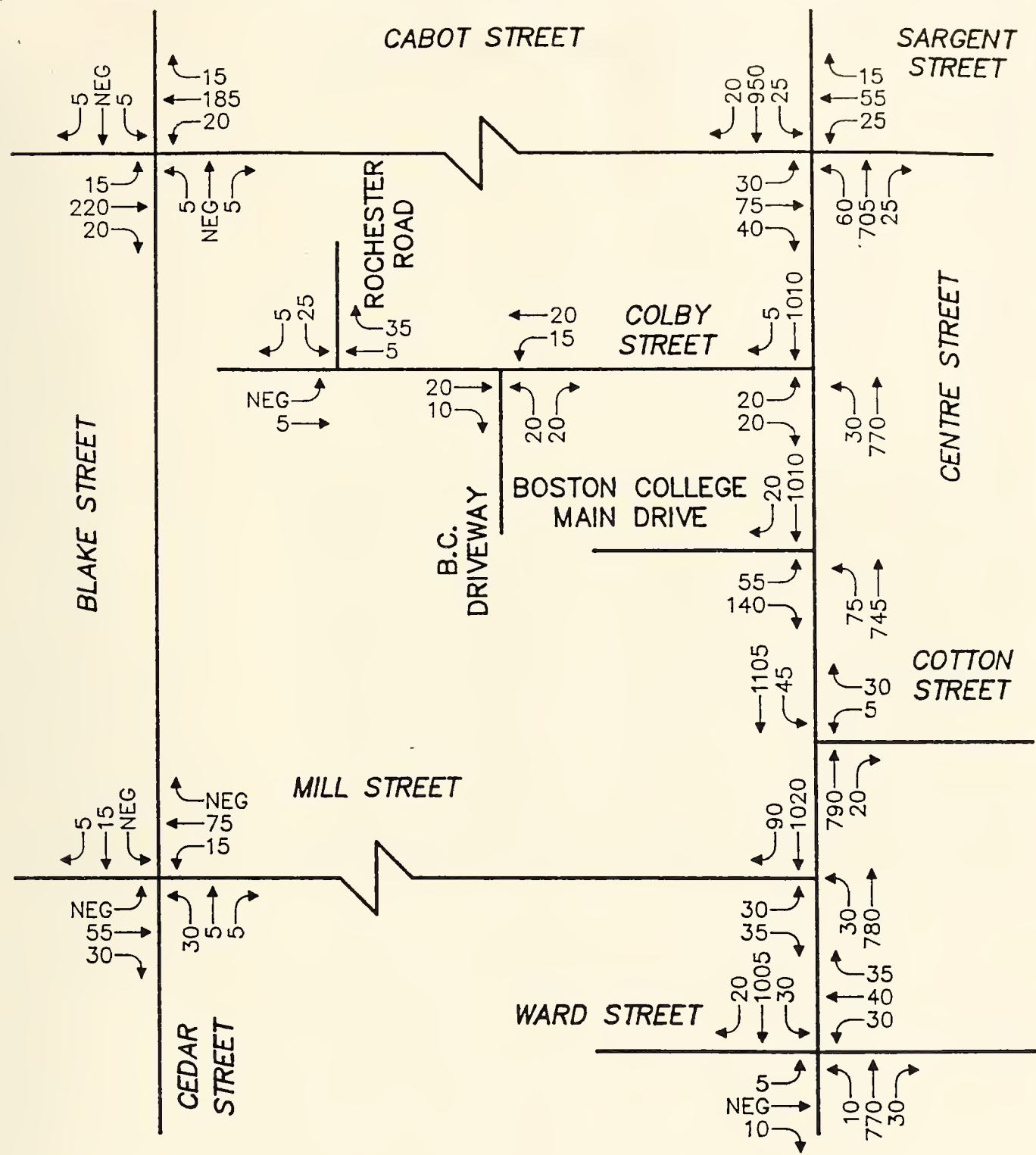




Vanasse Hangen Brustlin, Inc.

Average Daily
Traffic Volume Map

Figure 4



NEG = Negligible

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1989 Existing
PM Peak Hour
Traffic Volumes

Figure 6

PROPOSED DEVELOPMENT PROGRAM

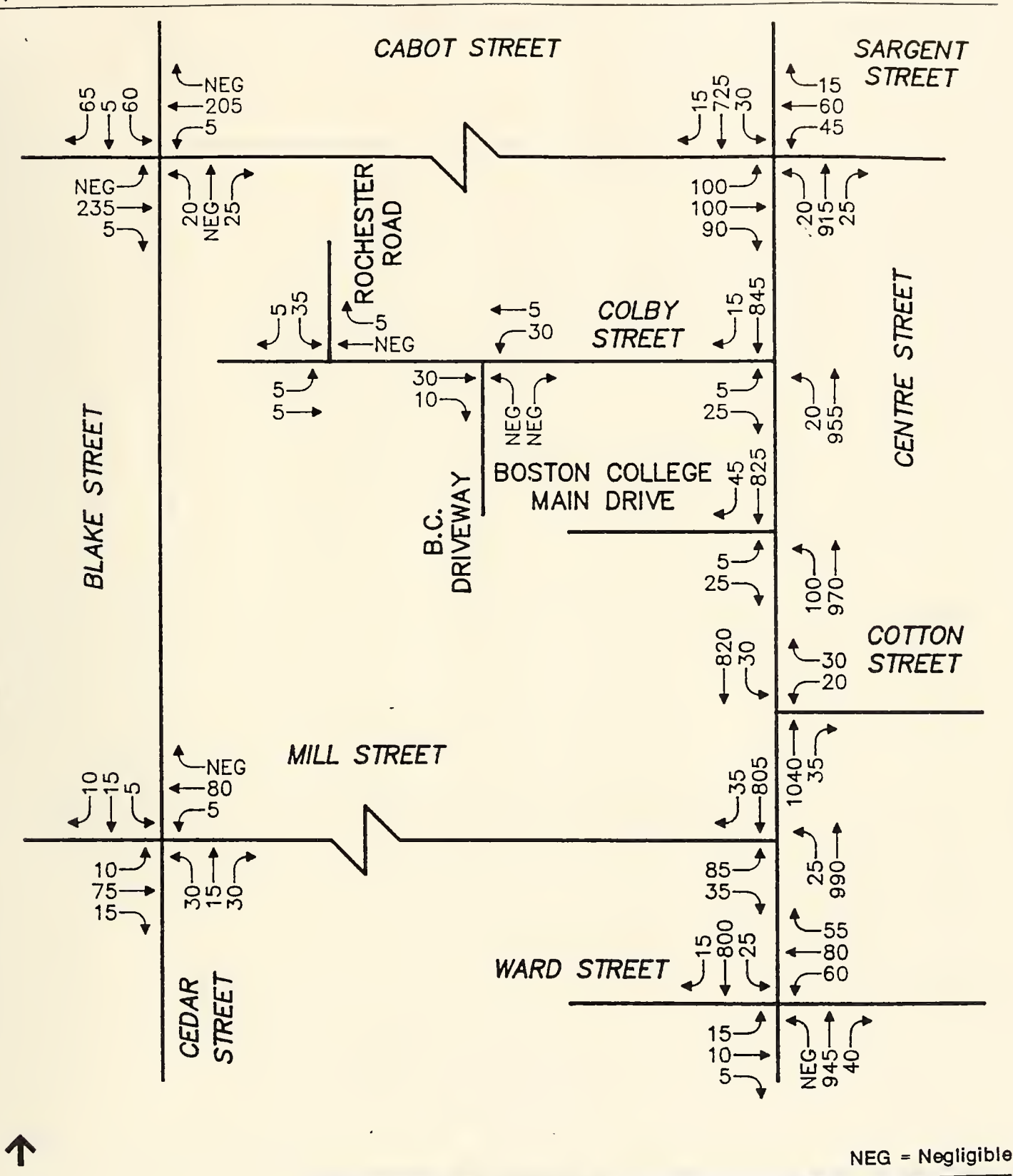
In May 1988, Boston College was granted subdivision approval for the campus in Newton. While the final development program for the site is not certain, Boston College has studied and is considering the eventual construction of a 400- to 500-bed dormitory to house graduate students. While no firm commitment to construction has been made, it is assumed for the purpose of this report that a 500-bed dormitory will be constructed by 1992. The Build year of 1992 was chosen to reflect the earliest possible occupancy if construction were indeed pursued. Access to and egress from the site by way of the existing main driveway on Centre Street and secondary driveway on Colby Street was assumed. No new driveways were assumed in conjunction with the potential development of the site. At the request of Boston College, however, the impact of opening the existing Mill Street entrance has been examined and is addressed later in this report.

INTRODUCTION

To determine future travel demands on the study area roadway network, traffic volumes were projected to the year 1992, the earliest possible date for completion of any development on the Boston College Newton campus. Traffic volumes on the roadway network at that time will likely include existing traffic, new traffic due to normal traffic growth, and traffic generated by the Newton campus development if complete. These factors were considered when developing the 1992 projected traffic flow networks.

ESTIMATED BACKGROUND TRAFFIC

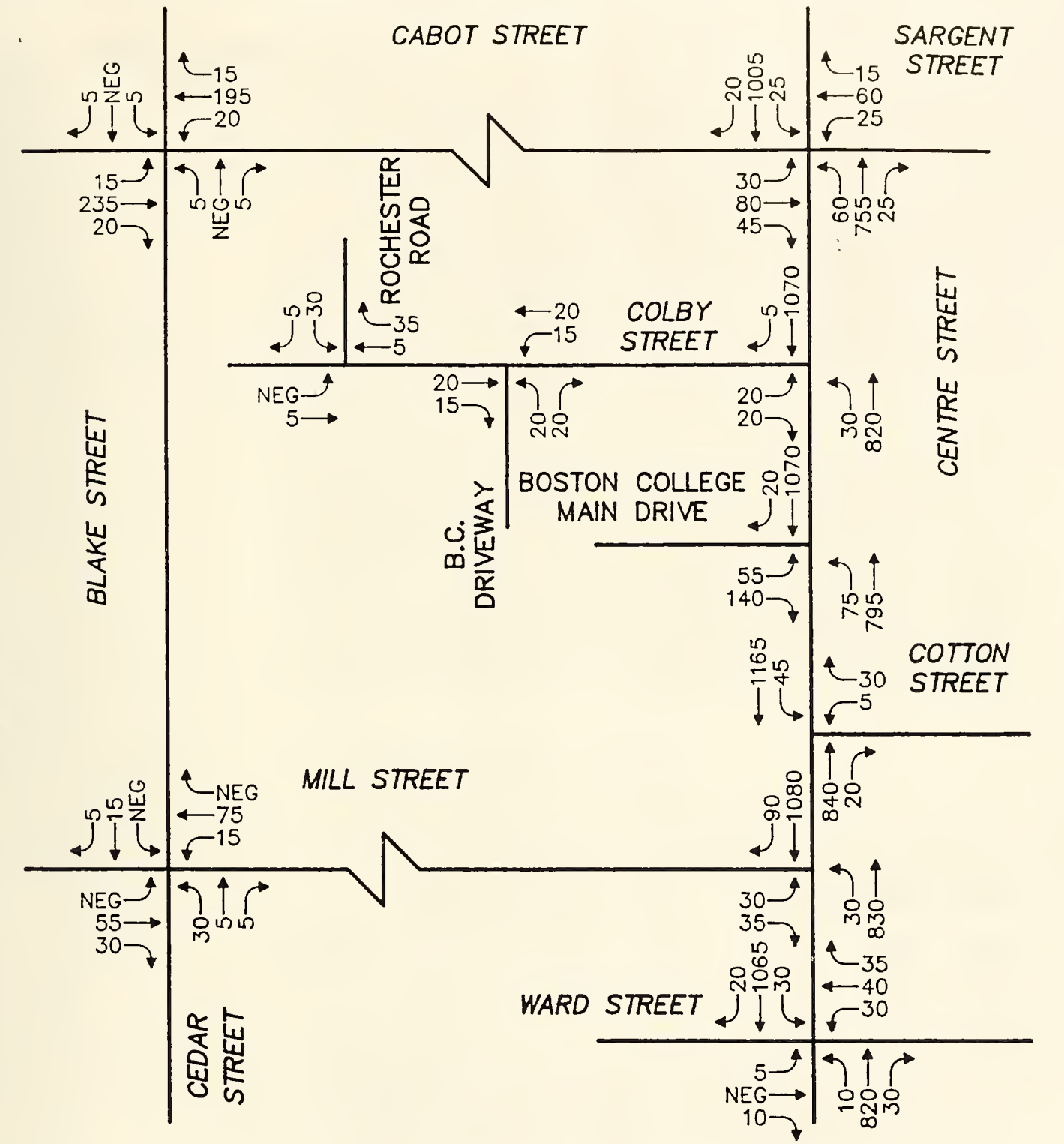
Traffic growth on roadways within a given study area are a function of land development in a region. The region surrounding the Boston College Newton campus is predominately single-family residences. Background traffic growth in the study area is, therefore, likely to be influenced exclusively by growth outside the immediate area. This growth is manifested in the form of through traffic primarily along Centre Street. To account for this, volumes along Centre Street were adjusted by a 2 percent annual growth factor. The factor is based on historical traffic volume data and was supplied by officials of the city of Newton. Traffic along Cabot Street was also adjusted as directed by the city of Newton. Traffic volumes on the local streets within the study area were not adjusted. The 1992 No-Build traffic networks are shown in Figures 7 and 8.



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1992 No-Build
AM Peak Hour
Traffic Volumes

Figure 7



NEG = Negligible

Vanasse Hangen Brustlin, Inc.

1992 No-Build
PM Peak Hour
Traffic Volumes

Figure 8

SITE-GENERATED TRAFFIC

Traffic increases as a result of the potential development on the Boston College Newton campus is a function of the projected student population. If the campus is developed as set forth above, Boston College officials anticipate that 250 of the 500 beds will be occupied by graduate students currently commuting to campus. Since students who live off campus and drive account for a minimum two trips per day, a decrease in commuter trips is anticipated if additional on-campus housing is constructed. However, in an effort to simplify matters and present the most conservative trip generation estimate, this reduction was not incorporated into the final trip generations figures. The remaining beds are assumed to be filled by new students.

To determine the traffic impact of an 250-student increase in enrollment both empirical and observed trip rates were compared. The Institute of Transportation Engineers (ITE) Trip Generation¹ lists empirical trip generation data for educational institution land use is based on student population. Land Use Code (LUC) 540 was chosen as it best reflects the Boston College Newton campus land use. Measure rates are based on peak-hour turning movement counts at the campus driveways and student population information provided by Boston College. Table 2 compares empirical and measured rates.

Table 2

TRIP GENERATION RATE COMPARISON

	Trip Rate*					
	LUC 540			Measured**		
	Morning	Evening	Daily	Morning	Evening	Daily
Enter	.15	.04	.77	.12	.08	N/A
Exit	<u>.03</u>	<u>.08</u>	<u>.77</u>	<u>.02</u>	<u>.15</u>	N/A
TOTAL	.18	.12	1.54	.14	.23	N/A

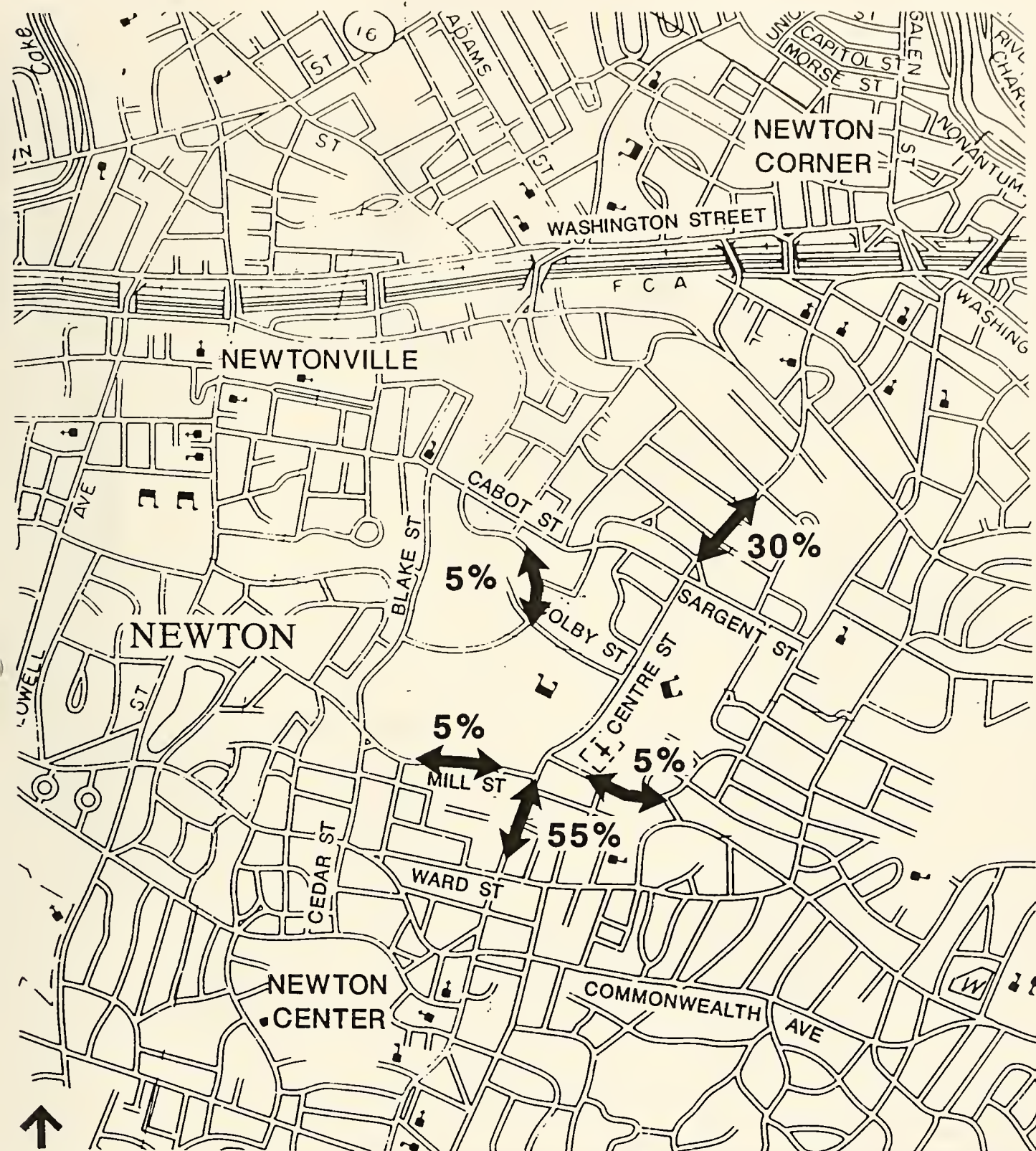
* Per student.

** Based on peak-hour manual turning movement counts.

Assumes campus population of 1,600 students.

N/A = Not applicable. Daily driveway volumes not measured.

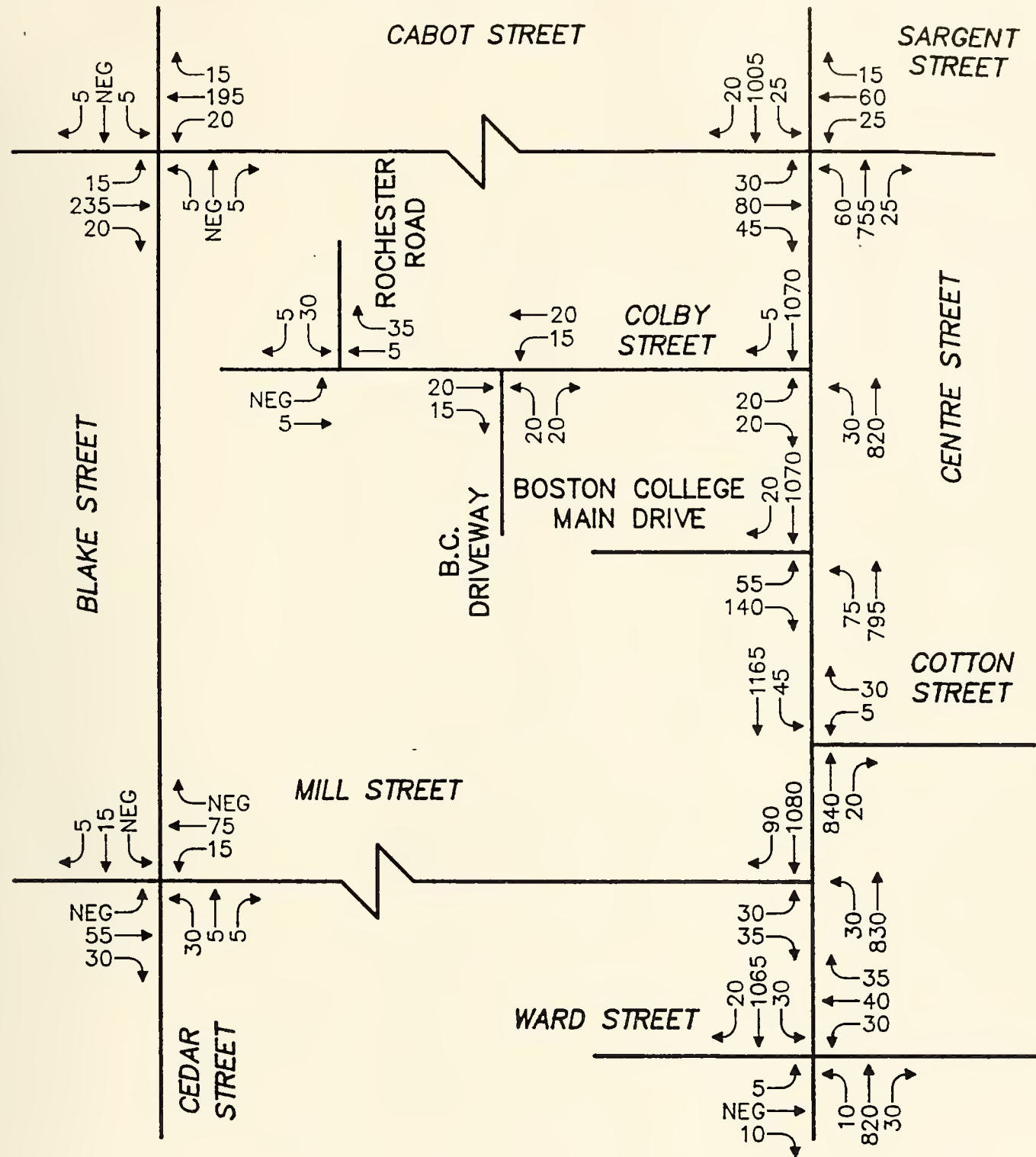
1 Trip Generation; Institute of Transportation Engineers; Fourth Edition (1987)



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Trip Distribution Map

Figure 9

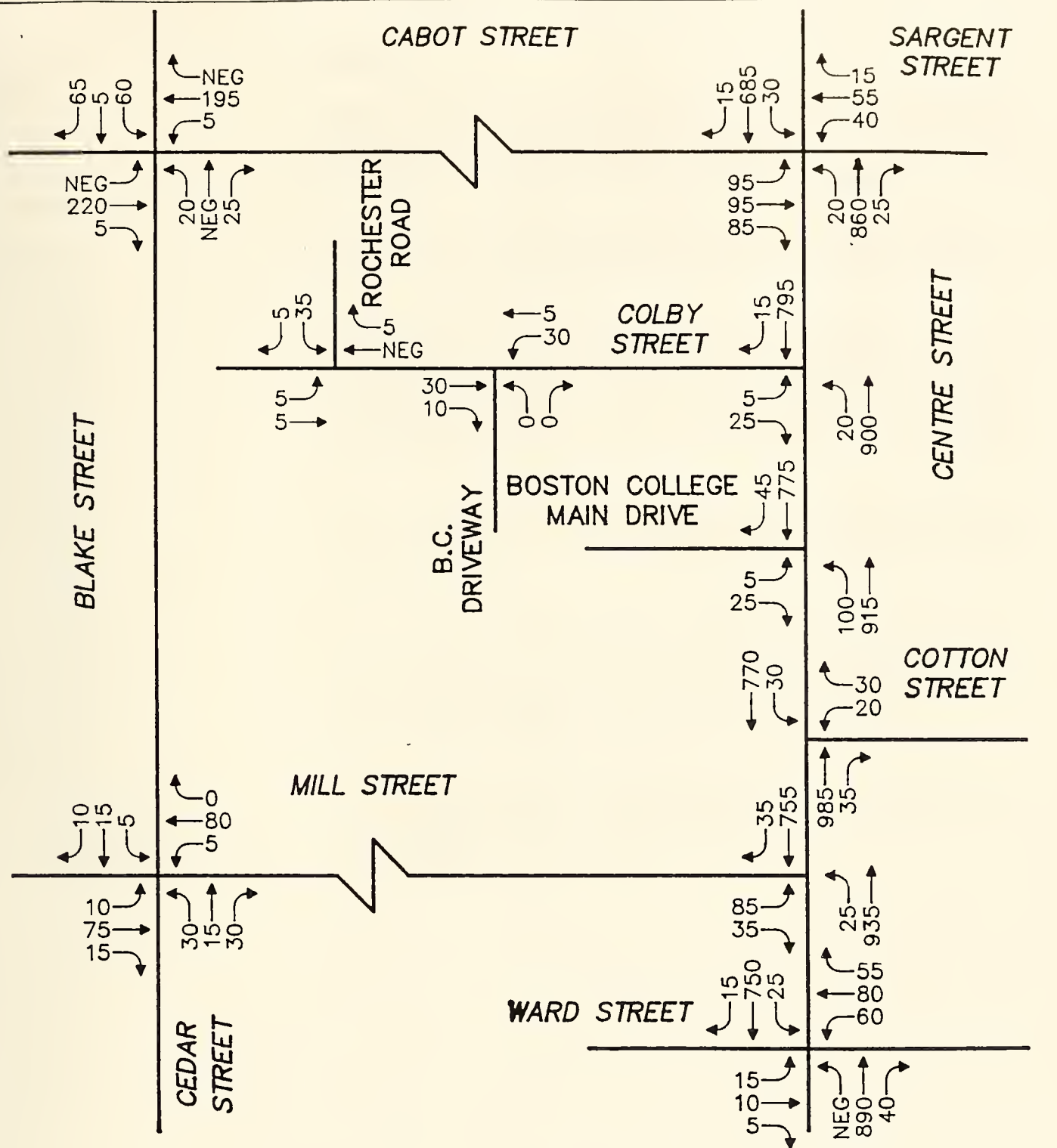


NEG = Negligible

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1992 No-Build
PM Peak Hour
Traffic Volumes

Figure 8



NEG = Negligible

Vanasse Hangen Brustlin, Inc.

1989 Existing
AM Peak Hour
Traffic Volumes

Figure 5



Accidents

Accident data for the study area were researched from information provided by the Newton Police Department. Information was obtained for the years 1987 and 1988. The results of the analysis of the accident data is summarized below:

- A total of twelve accidents occurred within the study area. Of the twelve accidents, four occurred in 1987 and eight occurred in 1988.
- The majority of the accidents (six) occurred at the intersection of Centre Street and Cabot Street. Of the remaining accidents, four occurred at Centre Street and Colby Street, while one was recorded at Centre Street and Richmond Road. One accident was referenced as occurring at 785 Centre Street.
- Seven accidents involved property damage only. Three of the remaining accidents were listed as involving non-fatal personal injury. Two accidents did not report accident severity.
- The majority of the accidents (six) were classified as angle collisions. Three rear-end accidents were reported in the study area. Two did not report accident type. The remaining accident involved a single vehicle which apparently ran off the road.
- Only five accidents occurred during the morning and evening peak hours. The day of the week was not reported in the information provided by the Newton Police Department.

As the table illustrates, measured rates are within the same order of magnitude of those given by ITE. While the empirical and measured rates are similar in magnitude, the measured trip rate is lower in the morning and higher in the evening. Because the ITE rates represent considerably more data and are more likely to reflect the average condition, they were used to determine future traffic increases to and from the Newton campus. A sensitivity analysis using the measured trip rates is included in the Appendix of this report for comparison.

Based on a net increase in enrollment of 250 students, peak hour and daily trips to and from the campus were estimated. Table 3 lists the results.

Table 3 TRIP GENERATION SUMMARY

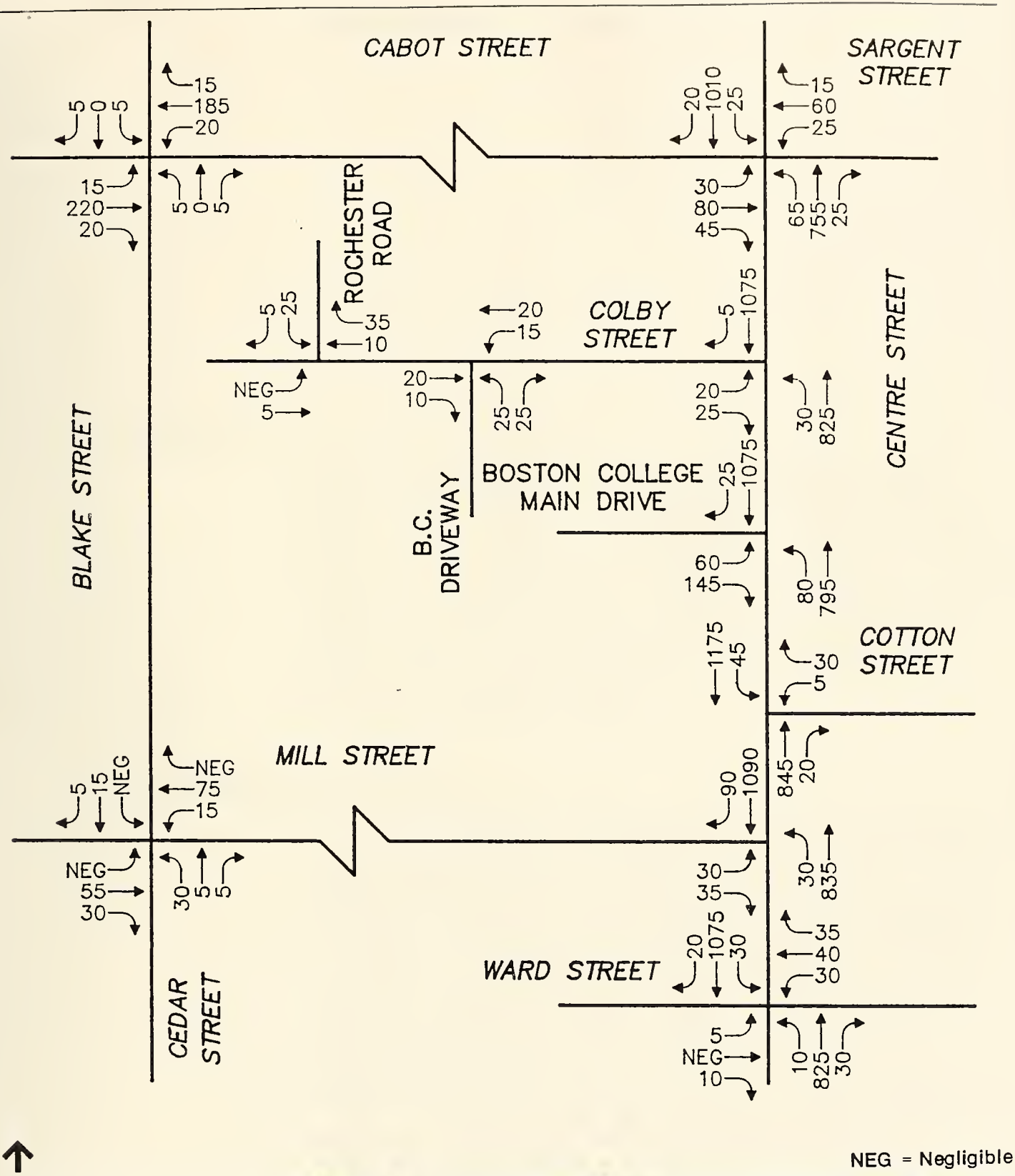
	<u>Entering</u>	<u>Exiting</u>	<u>Total</u>
Morning Peak Hour (vpd)	40	5	45
Evening Peak Hour (vpd)	10	20	30
Daily (vph)	195	195	390

* Vehicles per hour.

** Vehicles per day.

TRIP DISTRIBUTION AND ASSIGNMENT

The directional distribution of generated trips to and from the proposed development is expected to follow existing traffic patterns. These patterns are a function of population densities, the locations of major arterial roadways, shopping opportunities, and recreational activity. The observation of existing traffic patterns yielded the trip distribution presented in Table 4. This distribution is also shown in Figure 9.



1992 Build
PM Peak Hour
Traffic Volumes

Vanasse Hangen Brustlin, Inc.

Figure 11

INTRODUCTION

Examining traffic volumes on the local roadway network indicates the importance of these routes to the surrounding street system, but gives little indication of the quality of traffic flow. To measure quality of flow, the roadway link and intersection capacities were analyzed with respect to the 1989 Existing, 1992 No-Build, and 1992 Build conditions. The subsequent analysis provides a conservative estimate of how well the roadway system will serve future travel demands if the development is implemented. It also compares that estimate with the Existing and No-Build condition to assess the project's relative impact.

TRAFFIC PERFORMANCE MEASURES

Level of service (LOS) is a term that defines the different operating conditions that occur on a roadway or intersection when accommodating various traffic volumes. It is a qualitative measure of the effect of a number of operational factors including speed, travel delay, freedom to maneuver, and safety. By assigning a level of service to a roadway or intersection, an index to the operational qualities of the roadway or intersection is presented. Roadway levels of service range from LOS A (the highest level of service) to LOS F (the lowest level of service). In practice, any roadway link or intersection may operate at a wide range of levels of service, depending on the time of day, day of week, or period of the year. Level-of-service A is the optimum condition, representing free-flowing roadway operating conditions. Level-of-service E, on the other hand, represents an unstable flow condition where excessive congestion and long delays are prevalent. Level-of-service D represents tolerable conditions under peak-hour traffic flow conditions.⁴

Efficiency of vehicular movement on two-lane roadways is directly affected by the capacity and adequacy of associated intersections, as well as that of connecting roadway segments. In this study, both intersections and their connecting roadway links have been analyzed with respect to their vehicle carrying capabilities.

ROADWAY LINKS

The level of service provided by roadway segments is evaluated on the basis of two criteria: volume-to-capacity ratio (v/c) and operating speeds.

These criteria vary depending on the type of facility (e.g., multi-lane highway versus two-lane highway. Roadway capacities, in turn, are influenced by a number of factors including lane width, grades, lateral clearances, vehicle mix, and observed travel speeds. Roadway link level-of-service criteria for two-lane highways are given in Table 6.

Table 6

ROADWAY SEGMENT LEVEL-OF-SERVICE CRITERIA*

<u>Level of Service</u>	<u>Average Speed (mph**)</u>	<u>Volume-to-Capacity Ratio</u>
A	>54	0.04
B	>51	0.16
C	>48	0.32
D	>46	0.57
E	>41	1.00
F	<41	-

* Highway Capacity Manual, Special Report 209; Transportation Research Board, Washington, D.C. (1985). Assumes 100 percent no-passing zone and 50 mph design speed.

** Miles per hour.

Roadway Link Analysis

Analyses of four roadways within the study area were examined and are summarized in Table 7. Centre Street currently operates at LOS E (approximately 80 percent of capacity) and will continue to operate at that level under both 1992 No-Build and Build conditions. The links analyzed on Colby Street and Blake Street will continue to operate at LOS B or better. The addition of site-generated traffic has only a nominal effect study area roadway links.

TABLE 7
ROADWAY LINK ANALYSIS

Location	Peak Hour	1989		1992		1992	
		V/C*	Existing LOS**	V/C	No-Build LOS	V/C	Build LOS
Centre Street between Colby and Cabot Streets	Morning	.79	E	.83	E	.84	E
	Evening	.83	E	.87	E	.88	E
Centre Street between BC Main Access and Colby Street	Morning	.77	E	.82	E	.82	E
	Evening	.81	E	.87	E	.87	E
Centre Street between Mill and Ward Streets	Morning	.76	E	.79	E	.80	E
	Evening	.79	E	.84	E	.85	E
Cabot Street between Centre and Cabot Streets	Morning	.17	B	.19	B	.19	B
	Evening	.12	A	.14	A	.14	A
Blake Street between Cabot and Mill Streets	Morning	.02	A	.03	A	.03	A
	Evening	.03	A	.03	A	.03	A

* Volume-to-capacity ratio.

** Level of service.

The levels of service of the study area's unsignalized intersections were determined using a procedure described in 1985 Highway Capacity Manual.⁵ By this procedure, the maximum potential flow of vehicles for each minor approach is calculated based on the gap frequency/acceptance analysis procedure. The maximum potential flow is then compared to the demand at each minor approach, resulting in an estimate of the probable delay, reserve capacity, and level of service. The difference between available capacity and demand is defined as reserve capacity and is used as the criteria for determining level of service. This procedure accounts for lane configuration on both the minor and major approaches, conflicting traffic streams, type of intersection control, percent trucks and buses in the traffic stream, and vertical roadway alignment. Table 8 summarizes the relationship between level of service, reserve capacity, and probable delay.

Table 8 LEVEL-OF-SERVICE CRITERIA - UNSIGNALIZED INTERSECTIONS*

<u>LOS</u>	<u>Probable Delay</u>	<u>Available Reserve Capacity</u>
A	Little or no delay	400 vehicles/hour
B	Short traffic delays	300 to 399 vehicles/hour
C	Average traffic delays	200 to 299 vehicles/hour
D	Long traffic delays	100 to 199 vehicles/hour
E	Very long traffic delays	0 to 99 vehicles/hour
F	Extreme delays	

* Highway Capacity Manual, Special Report 209; Transportation Research Board, Washington, D.C. (1985).

Unsignalized Intersection Analysis

There are eight unsignalized intersections within the study area. The analysis results, as summarized in Table 9, show that the unsignalized intersections along Centre Street generally operate at low levels of service. With the exception of the intersection of Centre Street and Cotton Street during the evening peak hour (LOS C), all of the Centre Street unsignalized intersections within the study are projected to operate at LOS D or less under 1992 No-Build and Build conditions. This is due primarily to the increase in traffic along Centre Street resulting from the growth of through traffic. The higher through volumes on Centre Street

⁵ Highway Capacity Manual, Special Report 209; Transportation Research Board, Washington, D.C. (1985).

TABLE 9
UNSIGNALIZED INTERSECTION ANALYSIS

Intersection	Peak Hour	1989 Existing		1992 No-Build		1992 Build	
		Reserve Cap.*	LOS	Reserve Cap.	LOS	Reserve Cap.	LOS
Centre Street and Mill Street	Morning Evening	-30 55	F E	-30 50	F E	-30 50	F E
Centre Street and Cotton Street	Morning Evening	85 210	E C	80 205	E C	80 205	E C
Centre Street and BC Main Driveway	Morning Evening	200 -35	C F	195 -40	D F	195 -55	D F
Centre Street and Colby Street	Morning Evening	230 100	C D	195 75	D E	190 75	D E
Colby Street and BC Main Driveway	Morning Evening	1,120 940	A A	1,120 910	A A	1,110 900	A A
Colby Street and Rochester Road	Morning Evening	880 885	A A	880 885	A A	880 870	A A
Parkview Avenue, Cabot Street, and Blake Street	Morning Evening	535 590	A A	520 610	A A	520 610	A A
Mill Street, Blake Street, and Cedar Street	Morning Evening	720 685	A A	720 685	A A	720 685	A A

* Reserve capacity is defined as the difference between theoretical available capacity and demand.

causes side street delay to increase, thereby decreasing level of service. The addition of site traffic will have little impact on traffic operations at these intersections as is illustrated in the table. The remaining intersections listed in Table 10 will operate at LOS A under both the No-Build and Build scenarios, just as they do today.

SIGNALIZED INTERSECTIONS

Levels of service for signalized intersections are calculated using the operational analysis methodology of the 1985 Highway Capacity Manual.⁶ This method assesses the effects of signal type, timing, phasing, progression, vehicle mix, and geometrics on delay. Level-of-service designations are based solely on the criterion of calculated average stopped delay per vehicle. Table 10 summarizes the relationship between level of service and delay. The tabulated delay criterion may be applied in assigning level-of-service designations to individual lane groups or intersection approaches, or to the entire intersection.

Table 10 LEVEL-OF-SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS*

<u>Level of Service</u>	<u>Stopped Delay per Vehicle (seconds)</u>
A	<5.0
B	5.1 to 15.0
C	15.1 to 25.0
D	25.1 to 40.0
E	40.1 to 60.0
F	>60.0

* Highway Capacity Manual, Special Report 209; Transportation Research Board, Washington, D.C. (1985). Assumes 100 percent no-passing zone and 50 mph design speed.

Traffic signal timings provided by the city of Newton Department of Public Works and VHB's observations of geometry, pedestrians, parking, and transit activity were used in the analyses. The results of the signalized analyses--based on these figures, as well as existing and projected traffic volumes--are summarized in Table 11.

6 CINCH; Daniel F. Beagan (Central Transportation Planning Staff), Massachusetts Department of Public Works, based on: Transportation Research Board, Special Report 209, Chapter 9, Signalized Intersection - Operation and Design (1985).

Table 11

SIGNALIZED INTERSECTION ANALYSIS

<u>Intersection</u>	<u>Peak Hour</u>	<u>1989 Existing</u>		<u>1992 No-Build</u>		<u>1992 Build</u>	
		<u>Delay*</u>	<u>LOS**</u>	<u>Delay</u>	<u>LOS</u>	<u>Delay</u>	<u>LOS</u>
Centre Street, Cabot Street, and Sargent Street	Morning	10.3	B	13.8	B	14.16	B
	Evening	42.6	E	--	F	--	F
Centre Street and Ward Street	Morning	10.3	B	14.6	B	16.5	C
	Evening	27.7	D	49.0	E	53.1	E

* Average delay per vehicle entering the intersection expressed in seconds.

** Level of service.

-- Theoretical delay is greater than 90 seconds per vehicle. This represent a condition where volume-to-capacity ratio is greater than 1.2 calculated delay may be unrealistic according to the 1985 Highway Capacity Manual.

As the table indicates, under peak hour conditions, delay at both intersections is expected to increase from Existing to No-Build conditions. The intersection of Centre Street, Cabot Street and Sargent Street is expected to exceed capacity during the evening peak hour under both 1992 No-Build and Build conditions. The intersection of Centre Street and Ward Street is expected to operate at level-of-service E (near capacity) under both conditions during the evening peak. Both intersections will continue to operate at desirable levels of service during the morning peak hour. While the addition of site traffic increases delay, it is marginal when compared to that expected as a result of the growth in through traffic along Centre Street. It is evident that under these conditions, the queuing observed during the peak hour may increase in frequency and duration as traffic volumes increase.

The previous analysis has shown that the development of a 500-bed dormitory on the Boston College Newton campus will have little impact on the surrounding street system. While the impact of the potential development is expected to be nominal, measures to enhance traffic flow along Centre Street were analyzed. Specific geometric improvements which could improve traffic operations along Centre Street have been analyzed and are discussed by location below.

Centre Street between Cabot Street and Ward Street

Centre Street currently carries a maximum of approximately 25,300 vehicles per day (vpd) and is expected to carry 26,800 vpd by 1992 without development on the Newton campus. The roadway link analysis shows that Centre Street is operating at as much as 83 percent of capacity during the peak hour. By 1992, Centre Street is expected to be operating at 87 percent of capacity under No-Build conditions. Since Centre Street is quickly approaching capacity during the peak hour, a four-lane cross section was analyzed. The level of service (LOS) on Centre Street with a four-lane cross section increases from LOS E to C under both 1992 No-Build and Build conditions. Although a significant traffic flow benefit is realized, implementing this alternative would require substantial roadway widening. The potential expense of additional rights-of-way and easements, relocation of utilities, and construction, along with the disruption of the neighborhood character of Centre Street, would seem to preclude this alternative.

Centre Street, Boston College Newton Campus Main Driveway,
and
Cotton Street

Another potential improvement option involves realigning and signalizing the intersection of Centre Street, Boston College Newton campus main driveway, and Cotton Street. Cotton Street and the Boston College main driveway are offset such that left turns into the Newton campus and left turns on to Cotton Street overlap because of the short distance between the two streets. It is desirable, based on optimum design standards, to align the two streets; however, the impact on the Newton campus' main entrance must also be taken into account. The impact on Cotton Street must be considered as well. Local residents feel traffic to and from Boston College should not use Cotton Street. Aligning the Boston College main driveway with Cotton Street will only enhance the potential for "cut-through" traffic on Cotton Street. Boston College officials have expressed reluctance in the past to this proposal. Since turning volumes at the intersection are low and there is no apparent accident history (at least in the past two years), the realignment of the intersection may not be necessary.

In addition to realigning the intersection, it has been suggested that the intersection be signalized. While signalization may be justified and would certainly decrease delay for left-turning vehicles out of the Newton campus main driveway (and Cotton Street if it were aligned with the BC driveway), it would introduce additional delay along the more heavily traveled Centre Street approaches decreasing the level of service for the majority of drivers.

Installation of a left-turn lane into the Boston College Newton campus main driveway from northbound centre street may help to ease traffic flow as well as protect left-turning vehicles from the possibility of rear-end collision. To accommodate peak hour design volumes, the left-turn lane should be 80- to 100-feet long and a minimum ten feet wide. Storage length may be restricted due to the proximity of Cotton Street. A left-turn lane can be accommodated within Centre Street which has a 36-foot face-of-curb to face-of-curb roadway width by restriping existing pavement.

Also, stated in the Existing Conditions section of this report, overhanging shrubbery and a wall at the southeastern corner of Centre Street and Cotton Street contribute to poor sight distance, particularly for vehicles exiting Cotton Street. Trimming the shrubbery and trees at this location would improve sight distance and enhance safety at this location.

Boston College Mill Street Driveway

As part of this report, Boston College asked VHB to analyze the impact of removing the chain on the Mill Street driveway to provide alternative access/egress to and from the campus. As is discussed in the Trip Distribution section of this report, it is estimated that 5 percent of the total existing traffic generated by the Newton campus (ten vehicles per hour during the morning peak hour, fifteen vehicles per hour during the evening peak hour) uses Mill Street. Removing the chain and opening the Mill Street driveway would accommodate these trips to and from the campus. A small percentage of vehicles destined for Centre Street (most likely a percentage of those parked near the Mill Street driveway) would also use this access. The result would likely be a nominal increase in daily traffic on Mill Street, as well as a small decrease in traffic at the Newton Campus main driveway.

CONCLUSIONS/RECOMMENDATIONS

It is clear from field observations and the analysis herein that Centre Street within the study area is currently operating at or near capacity, particularly during the evening peak hour. The normal growth of background traffic in future years only serves to exacerbate these conditions. The 500-bed dormitory, if constructed, is anticipated to have a measurable, but nominal, impact on traffic operations. Traffic volumes along Centre Street are expected to increase by less than 3 percent during the peak hours compared to 1992 No-Build conditions. Volume increases on the remaining streets will be negligible. Traffic operations along Centre Street are therefore expected to become more congested by the 1992 base year whether the site is developed or not. The development of the Boston College Newton campus site will, if implemented, have a minimal traffic impact on the surrounding street system.

While the impacts of the potential project are small, several alternatives intended to relieve congestion along Centre Street were examined. Improvements such as widening Centre Street to four-lanes and realignment and signalization of Boston College Main driveway were studied. These are not recommended mainly on the basis of neighborhood impacts and cost. VHB does recommend the following:

- Shrubbery and overhanging foliage along the southwestern corner of the intersection of Cotton Street and Centre Street should be trimmed to enhance sight distance for vehicles exiting Cotton Street and vehicles approaching from the south along Centre Street.
- A left-turn lane on the northbound Centre Street in to the Boston College Main driveway should be constructed by restriping the existing pavement. The lane should be a minimum ten feet wide with eighty feet of storage.

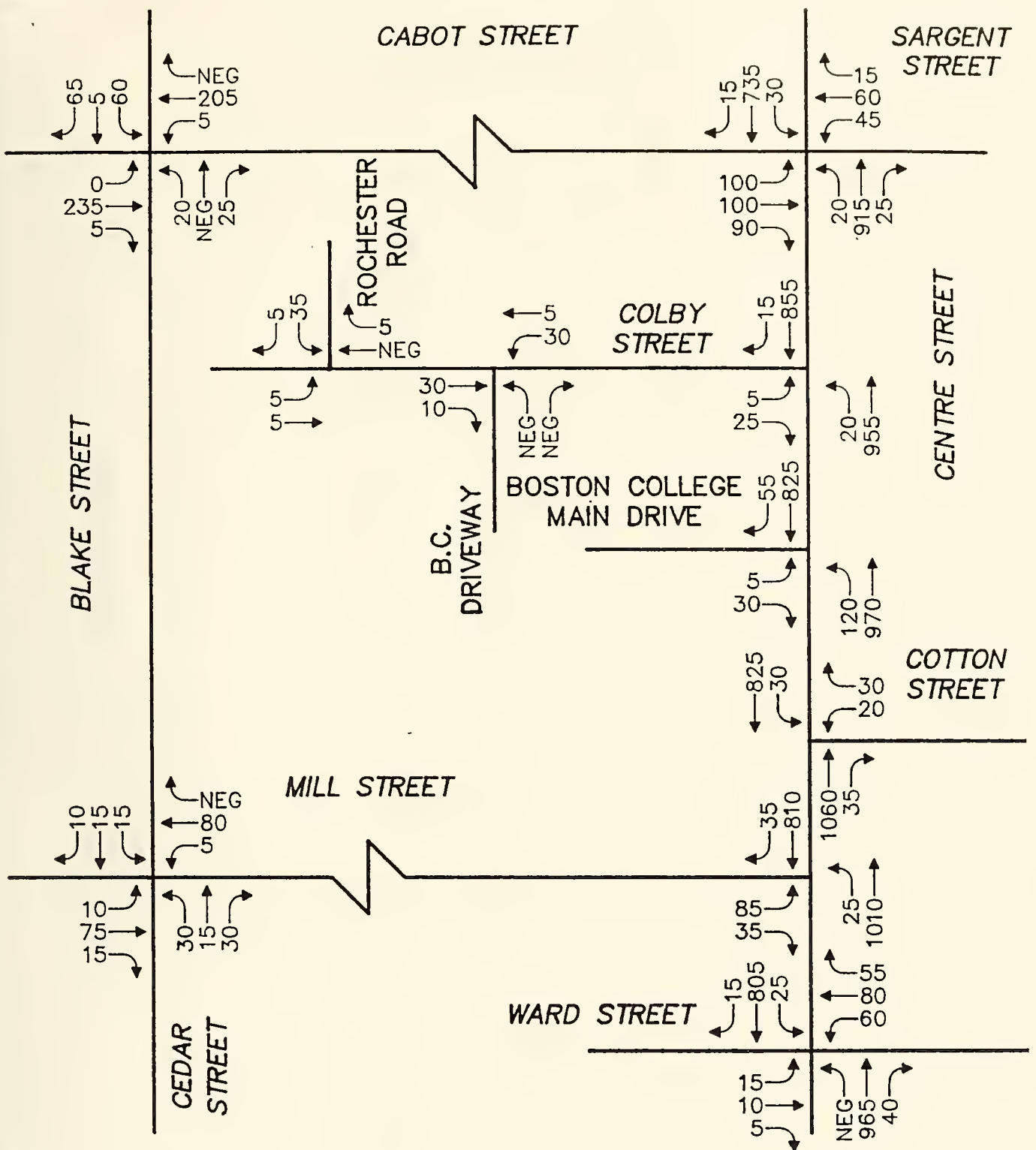
- The Mill Street driveway could be opened to provide better access to and egress from the Newton campus with nominal increases in traffic on Mill Street. This would also reduce the peak-hour traffic volume at the Newton campus main driveway.

APPENDIX

MEASURED TRIP GENERATION RATE
LEVEL-OF-SERVICE COMPARISON

Figure A-1 and A-2 illustrate morning and evening peak hour traffic volumes using measured trip rates. Table A-1 compares the level of service (LOS) for unsignalized and signalized intersections along Centre using both empirical trip rates and measured trip rates.

As shown in the Table, there is little difference in peak hour level of service. The only change occurs at the intersection of Centre Street, Cabot Street and Sargent Street when PM peak hour LOS changes from E to F. This change, however, only represents an increase in delay of nine seconds. The threshold for level-of-service F is sixty seconds.

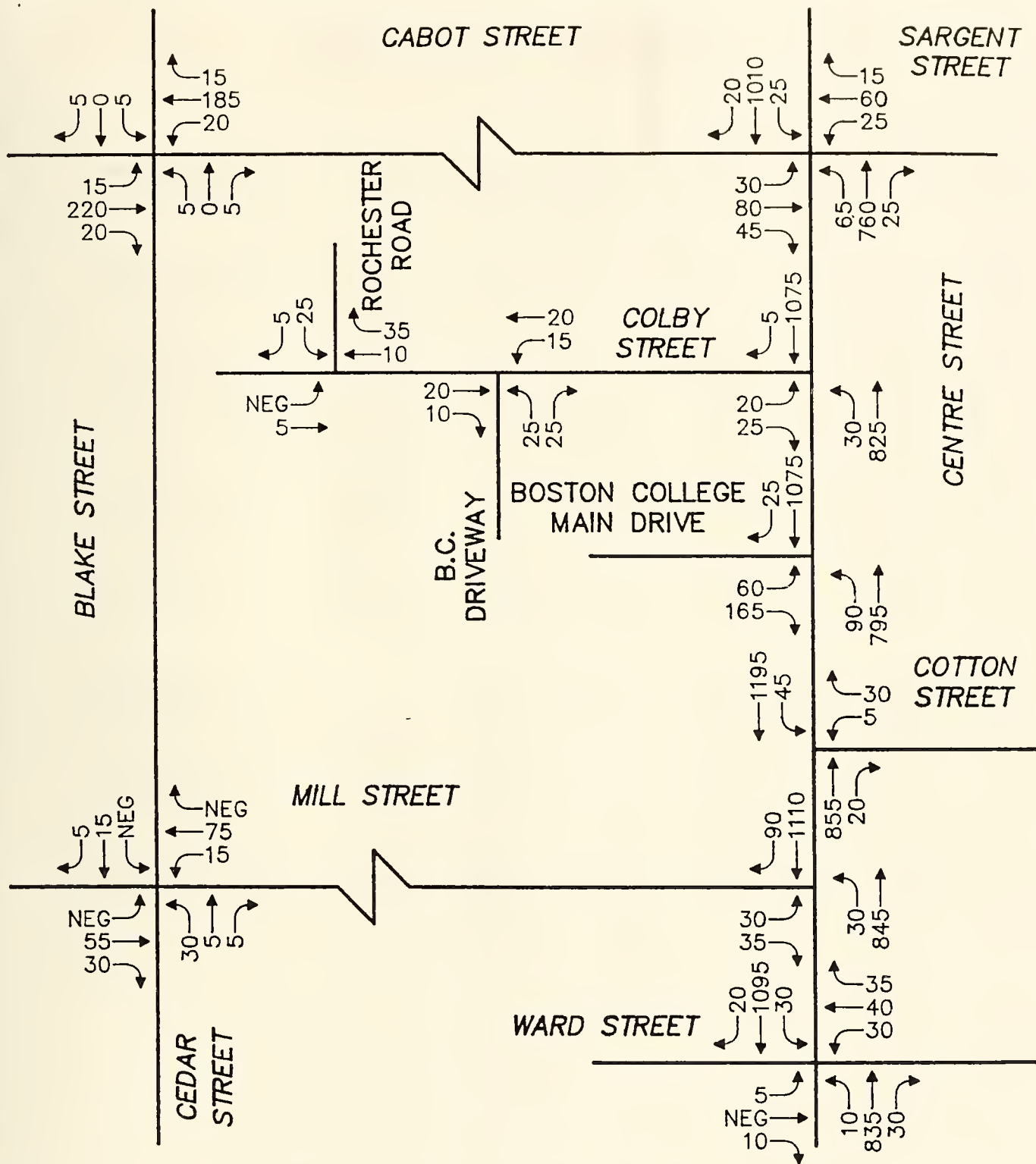


NEG=Negligible

Vanasse Hangen Brustlin, Inc.

1992 Build Using Measured
Trip Generation Rates
AM Peak Hour
Traffic Volumes

Figure A-1



NEG=Negligible

Vanasse Hangen Brustlin, Inc.

1992 Build Using Measured
Trip Generation Rates
PM Peak Hour
Traffic Volumes

Figure A-2

Table A-1

LEVEL-OF-SERVICE ANALYSIS COMPARISON
MEASURED TRIP RATES VERSUS EMPIRICAL TRIP RATES

<u>Unsignalized Intersections</u>	<u>Peak Hour</u>	<u>1992 No-Build</u>		<u>1992 Build ITE</u>		<u>1992 Build Measured</u>	
		<u>Res</u>	<u>Cap</u>	<u>Res</u>	<u>Cap</u>	<u>Res</u>	<u>LOS</u>
Centre Street/ Mill Street	Morning	-30	F	-30	F	-30	F
	Evening	50	E	50	E	50	E
Centre Street/ Cotton Street	Morning	80	E	80	E	80	E
	Evening	205	C	205	C	200	C
Centre Street/ BC Main Drive	Morning	195	D	195	D	195	D
	Evening	-40	F	-55	F	-65	F
Centre Street/ Colby Street	Morning	195	D	190	D	190	D
	Evening	75	E	75	E	75	E
Colby Street/ BC Access	Morning	1,120	A	1,110	A	1,110	A
	Evening	910	A	900	A	900	A
<u>Signalized Intersections</u>		<u>Delay</u>	<u>LOS</u>	<u>Delay</u>	<u>LOS</u>	<u>Delay</u>	<u>LOS</u>
Centre Street/ Ward Street/ Centre Street	Morning	14.6	B	16.53	C	16.53	C
	Evening	49.0	E	53.1	E	62.8	F
Cabot Street/ Sargent Street	Morning	13.8	B	14.2	B	14.2	B
	Evening	146.3	F	163.6	F	169.2	F

Weather :

DATE: 5/01/89

[illegible]

COMBINED TOTALS

TIME	1	2	3	4	5	6	7	8
12:00 AM	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0
4:00	0	0	0	0	0	0	0	0
5:00	0	0	0	0	0	0	0	0
6:00	0	0	0	0	0	0	0	0
7:00	0	0	0	0	0	0	0	0
8:00	0	0	0	0	0	0	0	0
9:00	0	0	0	0	0	0	0	0
10:00	0	0	0	0	0	0	0	0
11:00	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0
1:00	1	1	1	1	1	1	1	1
2:00	1	1	1	1	1	1	1	1
3:00	1	1	1	1	1	1	1	1
4:00	1	1	1	1	1	1	1	1
5:00	1	1	1	1	1	1	1	1
6:00	1	1	1	1	1	1	1	1
7:00	1	1	1	1	1	1	1	1
8:00	1	1	1	1	1	1	1	1
9:00	1	1	1	1	1	1	1	1
10:00	1	1	1	1	1	1	1	1
11:00	1	1	1	1	1	1	1	1
TOTALS	0	1	1	1	1	1	1	0

VANNASSE/HANSEN/BRUSTLIN
HOURLY, 2 CHANNEL VEHICLE COUNT

REFERENCE: 2415

CORRECTION FACTOR: 1.00

LOCATION: CENTRE ST/BET RC ENT. & MILL RD NEWTON, MA

FILENAME: CENTREBC

WEATHER:

WEEK OF MONDAY 5 / 1 / 87

OPERATOR: SES/BR

HOUR BEGIN	MONDAY 1		TUESDAY 2		WEDNESDAY 3		THURSDAY 4		FRIDAY 5		SATURDAY 6		SUNDAY 7		WEEKDAY AVERAGE	
	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N
12 AM	*	*	*	*	*	*	122	76	132	97	*	*	*	*	127	87
1	*	*	*	*	*	*	52	43	62	62	*	*	*	*	57	53
2	*	*	*	*	*	*	34	20	40	21	*	*	*	*	37	21
3	*	*	*	*	*	*	16	15	18	13	*	*	*	*	17	14
4	*	*	*	*	*	*	16	22	29	30	*	*	*	*	23	26
5	*	*	*	*	*	*	67	136	60	128	*	*	*	*	64	132
6	*	*	*	*	*	*	258	395	257	372	*	*	*	*	258	384
7	*	*	*	*	*	*	601	840	581	857	*	*	*	*	591	849
8	*	*	*	*	*	*	811	1035	824	1046	*	*	*	*	818	1041
9	*	*	*	*	*	*	685	823	661	786	*	*	*	*	670	805
10	*	*	*	*	*	*	620	669	630	704	*	*	*	*	625	687
11	*	*	*	*	*	*	702	706	*	*	*	*	*	*	702	706
12 PM	*	*	*	*	562	670	678	668	*	*	*	*	*	*	670	669
1	*	*	*	*	799	664	765	634	*	*	*	*	*	*	782	649
2	*	*	*	*	784	785	759	693	*	*	*	*	*	*	772	739
3	*	*	*	*	932	802	890	709	*	*	*	*	*	*	911	771
4	*	*	*	*	969	793	1006	750	*	*	*	*	*	*	983	772
5	*	*	*	*	1155	862	1109	811	*	*	*	*	*	*	1147	839
6	*	*	*	*	1050	775	972	848	*	*	*	*	*	*	1011	812
7	*	*	*	*	872	762	851	692	*	*	*	*	*	*	862	727
8	*	*	*	*	570	562	644	607	*	*	*	*	*	*	607	585
9	*	*	*	*	546	521	568	523	*	*	*	*	*	*	557	522
10	*	*	*	*	435	330	429	360	*	*	*	*	*	*	432	345
11	*	*	*	*	256	162	283	210	*	*	*	*	*	*	270	186
TOTALS	*	*	*	*	9030	7668	12966	12320	3294	4116	*	*	*	*	13001	12421

COMBINED TOTALS

12	*	*	*	*			198		229		*	*			214	
1	*	*	*	*	*	*	95		124		*	*			110	
2	*	*	*	*	*	*	54		61		*	*			58	
3	*	*	*	*	*	*	31		31		*	*			31	
4	*	*	*	*	*	*	38		59		*	*			49	
5	*	*	*	*	*	*	203		188		*	*			196	
6	*	*	*	*	*	*	653		629		*	*			642	
7	*	*	*	*	*	*	1441		1438		*	*			1440	
8	*	*	*	*	*	*	1846		1870		*	*			1859	
9	*	*	*	*	*	*	1508		1447		*	*			1478	
10	*	*	*	*	*	*	1289		1334		*	*			1312	
11	*	*	*	*	*	*	1408		*		*	*			1408	
12	*	*	*	*		1332	1346		*		*	*			1339	
1	*	*	*	*		1463	1399		*		*	*			1431	
2	*	*	*	*		1569	1452		*		*	*			1511	
3	*	*	*	*		1734	1629		*		*	*			1682	
4	*	*	*	*		1762	1756		*		*	*			1750	
5	*	*	*	*		2017	1955		*		*	*			1986	
6	*	*	*	*		1825	1820		*		*	*			1823	
7	*	*	*	*		1634	1540		*		*	*			1589	
8	*	*	*	*		1132	1251		*		*	*			1192	
9	*	*	*	*		1067	1091		*		*	*			1077	
10	*	*	*	*		765	789		*		*	*			777	
11	*	*	*	*		418	493		*		*	*			456	
TOTALS	*	*	*	*		16718	25286		7410		*	*			25422	

SITE CODE : 00002415
 Location : CENTER ST. BET. COLBY & E.D.
 Weather : MAIN DR. NEWTON, MA.
 Operator : GIL

PAGE: 1
 FILE: CENTRE
 DATE: 5/08/89

TIME	MONDAY 8		TUESDAY 9		WEDNESDAY 10		THURSDAY 11		FRIDAY 12		SATURDAY 13		SUNDAY 14		WEEK AVERAGE	
BEGIN	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2
12:00 AM	1	1	1	1	87	112	71	97	1	1	1	1	1	1	79	104
1:00	1	1	1	1	52	36	47	39	1	1	1	1	1	1	49	37
2:00	1	1	1	1	18	23	28	29	1	1	1	1	1	1	23	26
3:00	1	1	1	1	17	12	17	20	1	1	1	1	1	1	17	16
4:00	1	1	1	1	13	21	18	27	1	1	1	1	1	1	15	24
5:00	1	1	1	1	116	58	114	54	1	1	1	1	1	1	115	56
6:00	1	1	1	1	357	232	333	239	1	1	1	1	1	1	345	235
7:00	1	1	1	1	834	641	813	622	1	1	1	1	1	1	823	631
8:00	1	1	1	1	913	617	963	613	1	1	1	1	1	1	938	615
9:00	1	1	1	1	700	710	768	662	1	1	1	1	1	1	734	686
10:00	1	1	1	1	620	656	579	661	1	1	1	1	1	1	599	658
11:00	1	1	1	1	622	706	679	639	1	1	1	1	1	1	650	672
12:00 PM	1	1	1	1	651	750	477	555	1	1	1	1	1	1	584	652
1:00	1	1	1	1	651	691	1	1	1	1	1	1	1	1	651	691
2:00	1	1	1	1	697	834	1	1	1	1	1	1	1	1	697	834
3:00	1	1	702	871	747	925	1	1	1	1	1	1	1	1	724	898
4:00	1	1	755	981	811	907	1	1	1	1	1	1	1	1	783	944
5:00	1	1	825	1113	749	1086	1	1	1	1	1	1	1	1	787	1099
6:00	1	1	780	1068	699	1101	1	1	1	1	1	1	1	1	739	1084
7:00	1	1	675	867	635	827	1	1	1	1	1	1	1	1	638	847
8:00	1	1	561	595	494	558	1	1	1	1	1	1	1	1	527	576
9:00	1	1	447	526	453	513	1	1	1	1	1	1	1	1	451	519
10:00	1	1	337	381	289	379	1	1	1	1	1	1	1	1	313	396
11:00	1	1	213	247	174	229	1	1	1	1	1	1	1	1	193	238
TOTALS	1	1	5257	6649	11399	12824	4907	4467	1	1	1	1	1	1	11451	12722

COMBINED TOTALS

12:00 AM	1	1	199	168	1	1	1	183
1:00	1	1	88	86	1	1	1	86
2:00	1	1	41	57	1	1	1	49
3:00	1	1	29	37	1	1	1	33
4:00	1	1	34	45	1	1	1	39
5:00	1	1	174	168	1	1	1	171
6:00	1	1	589	572	1	1	1	580
7:00	1	1	1475	1435	1	1	1	1454
8:00	1	1	1730	1776	1	1	1	1753
9:00	1	1	1410	1430	1	1	1	1420
10:00	1	1	1276	1240	1	1	1	1257
11:00	1	1	1328	1318	1	1	1	1322
12:00 PM	1	1	1401	1032	1	1	1	1216
1:00	1	1	1342	1	1	1	1	1342
2:00	1	1	1531	1	1	1	1	1531
3:00	1	1573	1672	1	1	1	1	1622
4:00	1	1736	1718	1	1	1	1	1727
5:00	1	1938	1835	1	1	1	1	1866
6:00	1	1848	1800	1	1	1	1	1823
7:00	1	1502	1462	1	1	1	1	1482
8:00	1	1156	1052	1	1	1	1	1103
9:00	1	975	966	1	1	1	1	970
10:00	1	718	658	1	1	1	1	683
11:00	1	460	463	1	1	1	1	431
<hr/>								
TOTALS	1	11906	24223	9364	1	1	1	24173

VANNASSE/HANGEN/BRUSTLIN
HOURLY, 2 CHANNEL VEHICLE COUNT

REFERENCE: 2415

CORRECTION FACTOR: 1.00

LOCATION: CENTRE ST/BET CABOT ST & COLBY NEWTON, MA

FILENAME: CENTRECC

WEATHER:

WEEK OF MONDAY 5 / 1 / 89

OPERATOR: SES/GR

HOUR BEGINS	MONDAY 1		TUESDAY 2		WEDNESDAY 3		THURSDAY 4		FRIDAY 5		SATURDAY 6		SUNDAY 7		WEEKDAY AVERAGE	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
12 AM	1	1	1	1	1	1	78	112	77	120	1	1	1	1	78	116
1	1	1	1	1	1	1	38	44	56	53	1	1	1	1	47	49
2	1	1	1	1	1	1	20	31	21	38	1	1	1	1	21	35
3	1	1	1	1	1	1	12	13	12	18	1	1	1	1	12	16
4	1	1	1	1	1	1	20	15	27	28	1	1	1	1	24	22
5	1	1	1	1	1	1	120	60	121	60	1	1	1	1	121	60
6	1	1	1	1	1	1	384	267	354	256	1	1	1	1	369	262
7	1	1	1	1	1	1	779	613	806	599	1	1	1	1	794	606
8	1	1	1	1	1	1	927	849	869	892	1	1	1	1	898	871
9	1	1	1	1	1	1	680	764	687	666	1	1	1	1	684	715
10	1	1	1	1	1	1	630	603	1	1	1	1	1	1	630	603
11	1	1	1	1	1	1	645	669	1	1	1	1	1	1	645	669
12 PM	1	1	1	1	618	669	599	663	1	1	1	1	1	1	609	666
1	1	1	1	1	616	758	588	719	1	1	1	1	1	1	602	739
2	1	1	1	1	739	762	646	740	1	1	1	1	1	1	693	751
3	1	1	1	1	775	902	696	860	1	1	1	1	1	1	736	881
4	1	1	1	1	744	939	711	986	1	1	1	1	1	1	728	963
5	1	1	1	1	808	1170	770	1128	1	1	1	1	1	1	789	1149
6	1	1	1	1	724	1075	772	996	1	1	1	1	1	1	748	1036
7	1	1	1	1	722	875	662	856	1	1	1	1	1	1	692	866
8	1	1	1	1	536	551	584	629	1	1	1	1	1	1	560	590
9	1	1	1	1	492	523	494	551	1	1	1	1	1	1	493	537
10	1	1	1	1	338	426	347	412	1	1	1	1	1	1	343	419
11	1	1	1	1	156	219	202	253	1	1	1	1	1	1	179	236
TOTALS	1	1	1	1	7268	8869	11404	12833	3032	2730	1	1	1	1	11495	12857

COMBINED TOTALS

12	1	1	1	190	197	1	1	194
1	1	1	1	82	109	1	1	96
2	1	1	1	51	59	1	1	56
3	1	1	1	25	30	1	1	28
4	1	1	1	35	55	1	1	46
5	1	1	1	180	181	1	1	181
6	1	1	1	651	610	1	1	631
7	1	1	1	1392	1407	1	1	1400
8	1	1	1	1776	1761	1	1	1769
9	1	1	1	1444	1353	1	1	1399
10	1	1	1	1233	1	1	1	1233
11	1	1	1	1314	1	1	1	1314
12	1	1	1287	1262	1	1	1	1275
1	1	1	1374	1307	1	1	1	1341
2	1	1	1501	1386	1	1	1	1444
3	1	1	1677	1556	1	1	1	1617
4	1	1	1683	1697	1	1	1	1691
5	1	1	1976	1898	1	1	1	1938
6	1	1	1799	1766	1	1	1	1784
7	1	1	1597	1518	1	1	1	1558
8	1	1	1087	1213	1	1	1	1150
9	1	1	1015	1045	1	1	1	1030
10	1	1	764	759	1	1	1	762
11	1	1	375	455	1	1	1	415
TOTALS	1	1	16137	24237	5762	1	1	24352

FILE NAME : 0000110
 Location : MILL ST. / W OF CENTRE ST.
 Weather :
 Operator : VAN/GR

FILE: MILLST
 DATE: 4/24/87

TIME BEGIN	MONDAY 24		TUESDAY 25		WEDNESDAY 26		THURSDAY 27		FRIDAY 28		SATURDAY 29		SUNDAY 30		WEEK AVERAGE	
	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2
12:00 AM	1	1	11	0	2	5	3	7	0	0	0	0	0	0	2	2
1:00	1	1	1	0	3	4	3	1	0	0	0	0	0	0	1	0
2:00	1	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0
3:00	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0
4:00	1	1	2	0	1	2	1	2	0	0	0	0	0	0	0	0
5:00	1	1	6	1	3	2	6	1	0	0	0	0	0	0	2	0
6:00	1	1	28	1	26	8	30	7	0	0	0	0	0	0	14	2
7:00	1	1	117	26	71	39	86	45	0	0	0	0	0	0	45	18
8:00	1	1	126	31	93	57	95	62	0	0	0	0	0	0	52	25
9:00	1	1	83	19	68	37	72	44	0	0	0	0	0	0	37	16
10:00	1	1	63	16	58	34	44	33	0	0	0	0	0	0	27	14
11:00	1	1	44	22	48	45	53	40	0	0	0	0	0	0	24	17
12:00 PM	1	1	58	35	51	45	57	43	0	0	0	0	0	0	27	20
1:00	64	23	65	45	47	50	50	53	0	0	0	0	0	0	32	24
2:00	71	32	55	67	35	57	56	60	0	0	0	0	0	0	51	30
3:00	92	46	65	84	53	51	0	2	0	0	0	0	0	0	30	26
4:00	95	51	67	74	65	90	0	0	0	0	0	0	0	0	32	30
5:00	92	57	80	125	62	96	0	0	0	0	0	0	0	0	33	39
6:00	102	51	59	95	56	110	0	0	0	0	0	0	0	0	31	36
7:00	94	31	63	75	45	41	0	0	0	0	0	0	0	0	28	21
8:00	65	18	28	49	26	54	0	0	0	0	0	0	0	0	17	17
9:00	51	17	23	20	38	38	0	0	0	0	0	0	0	0	16	10
10:00	27	5	15	26	14	30	0	0	0	0	0	0	0	0	8	8
11:00	17	2	6	8	9	13	0	0	0	0	0	0	0	0	4	3
TOTALS	770	333	1070	822	874	906	557	400	0	0	0	0	0	0	493	358

COMBINED TOTALS

12:00 AM	1	11	7	10	0	0	0	4
1:00	1	1	7	4	0	0	0	1
2:00	1	2	0	1	0	0	0	0
3:00	1	4	0	0	0	0	0	0
4:00	1	2	3	3	0	0	0	0
5:00	1	7	5	7	0	0	0	2
6:00	1	29	34	37	0	0	0	16
7:00	1	143	110	131	0	0	0	63
8:00	1	157	150	157	0	0	0	77
9:00	1	102	105	116	0	0	0	53
10:00	1	81	92	77	0	0	0	41
11:00	1	66	93	93	0	0	0	41
12:00 PM	1	93	96	100	0	0	0	47
1:00	87	110	97	103	0	0	0	56
2:00	103	122	92	116	0	0	0	51
3:00	138	149	104	2	0	0	0	56
4:00	146	141	155	0	0	0	0	62
5:00	149	205	158	0	0	0	0	72
6:00	153	154	166	0	0	0	0	67
7:00	125	138	86	0	0	0	0	49
8:00	83	77	80	0	0	0	0	34
9:00	68	43	76	0	0	0	0	26
10:00	32	41	44	0	0	0	0	16
11:00	19	14	22	0	0	0	0	7
TOTALS	1103	1892	1782	957	0	0	0	851

SITE CODE : 00002415
Location : BLAKE ST/EET. CABOT & MILL ST.
Weather :
Operator : VAN/GR

PAGE: 1
FILE: BLAKEST
DATE: 4/24/89

TIME BEGIN	MONDAY 24		TUESDAY 25		WEDNESDAY 26		THURSDAY 27		FRIDAY 28		SATURDAY 29		SUNDAY 30		WEEK AVERAGE	
	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2
12:00 AM	1	1	0	1	1	1	2	3	0	0	0	0	0	0	0	0
1:00	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0
2:00	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
3:00	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0
5:00	1	1	1	1	4	2	2	0	0	0	0	0	0	0	1	0
6:00	1	1	2	3	1	2	3	4	0	0	0	0	0	0	1	1
7:00	1	1	12	12	13	15	18	16	0	0	0	0	0	0	7	7
8:00	1	1	14	21	18	30	22	35	0	0	0	0	0	0	9	14
9:00	1	1	12	16	10	14	17	14	0	0	0	0	0	0	6	7
10:00	1	1	11	6	9	6	17	18	0	0	0	0	0	0	6	5
11:00	1	1	6	11	11	10	16	11	0	0	0	0	0	0	5	5
12:00 PM	1	1	8	9	12	14	13	14	0	0	0	0	0	0	5	6
1:00	13	7	16	17	8	11	17	22	0	0	0	0	0	0	7	8
2:00	8	13	18	12	13	14	14	15	0	0	0	0	0	0	7	7
3:00	17	15	9	14	19	16	1	2	0	0	0	0	0	0	6	6
4:00	19	11	28	15	22	17	0	0	0	0	0	0	0	0	9	6
5:00	31	7	28	13	24	17	0	0	0	0	0	0	0	0	11	5
6:00	10	14	17	14	13	13	0	0	0	0	0	0	0	0	5	5
7:00	14	2	11	11	22	14	0	0	0	0	0	0	0	0	6	3
8:00	7	8	5	5	8	3	0	0	0	0	0	0	0	0	2	2
9:00	6	2	2	4	6	4	0	0	0	0	0	0	0	0	2	1
10:00	5	5	2	1	5	2	0	0	0	0	0	0	0	0	1	1
11:00	6	3	2	2	2	5	0	0	0	0	0	0	0	0	1	1
TOTALS	136	87	205	189	222	210	145	155	0	0	0	0	0	0	97	90

COMBINED TOTALS

12:00 AM	1	1	2	5	0	0	0
1:00	1	0	1	1	0	0	0
2:00	1	0	0	1	0	0	0
3:00	1	0	0	0	0	0	0
4:00	1	2	0	2	0	0	0
5:00	1	2	6	2	0	0	1
6:00	1	5	3	7	0	0	2
7:00	1	24	28	34	0	0	14
8:00	1	35	48	57	0	0	23
9:00	1	28	24	31	0	0	13
10:00	1	17	15	35	0	0	11
11:00	1	17	21	27	0	0	10
12:00 PM	1	17	26	27	0	0	11
1:00	20	33	19	39	0	0	15
2:00	21	30	27	29	0	0	14
3:00	32	23	35	3	0	0	12
4:00	30	43	39	0	0	0	15
5:00	38	41	41	0	0	0	16
6:00	24	31	26	0	0	0	10
7:00	16	22	36	0	0	0	9
8:00	15	10	11	0	0	0	4
9:00	8	6	10	0	0	0	3
10:00	10	3	7	0	0	0	2
11:00	9	4	7	0	0	0	2
TOTALS	223	394	432	360	0	0	197

TIME	MONDAY 8		TUESDAY 9		WEDNESDAY 10		THURSDAY 11		FRIDAY 12		SATURDAY 13		SUNDAY 14		WEEK AVERAGE	
REGIN	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2
12:00 AM	1	1	1	1	8	8	1	6	1	1	1	1	1	1	4	7
1:00	1	1	1	1	2	6	2	1	1	1	1	1	1	1	2	3
2:00	1	1	1	1	1	2	0	3	1	1	1	1	1	1	0	2
3:00	1	1	1	1	2	1	2	1	1	1	1	1	1	1	2	1
4:00	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	0
5:00	1	1	1	1	4	1	3	0	1	1	1	1	1	1	3	0
6:00	1	1	1	1	7	2	5	2	1	1	1	1	1	1	6	2
7:00	1	1	1	1	23	4	20	8	1	1	1	1	1	1	21	6
8:00	1	1	1	1	37	7	54	17	1	1	1	1	1	1	45	12
9:00	1	1	1	1	52	8	42	8	1	1	1	1	1	1	47	8
10:00	1	1	1	1	24	9	16	12	1	1	1	1	1	1	20	10
11:00	1	1	1	1	26	10	18	14	1	1	1	1	1	1	22	12
12:00 PM	1	1	1	1	18	25	21	27	1	1	1	1	1	1	19	26
1:00	1	1	1	1	21	20	1	1	1	1	1	1	1	1	21	20
2:00	1	1	1	1	24	27	1	1	1	1	1	1	1	1	24	27
3:00	1	1	1	1	17	22	1	1	1	1	1	1	1	1	17	22
4:00	1	1	29	30	15	31	1	1	1	1	1	1	1	1	22	30
5:00	1	1	28	39	17	26	1	1	1	1	1	1	1	1	22	32
6:00	1	1	30	30	28	28	1	1	1	1	1	1	1	1	29	29
7:00	1	1	24	15	15	14	1	1	1	1	1	1	1	1	19	14
8:00	1	1	19	25	19	21	1	1	1	1	1	1	1	1	19	23
9:00	1	1	13	22	9	21	1	1	1	1	1	1	1	1	11	21
10:00	1	1	6	21	5	12	1	1	1	1	1	1	1	1	5	16
11:00	1	1	8	19	6	9	1	1	1	1	1	1	1	1	7	14
TOTALS	1	1	157	201	381	315	184	99	1	1	1	1	1	1	387	337

COMBINED TOTALS

12:00 AM	1	1	16	7	1	1	1	11
1:00	1	1	8	3	1	1	1	5
2:00	1	1	3	3	1	1	1	2
3:00	1	1	3	3	1	1	1	3
4:00	1	1	2	0	1	1	1	0
5:00	1	1	5	3	1	1	1	3
6:00	1	1	9	7	1	1	1	8
7:00	1	1	27	28	1	1	1	27
8:00	1	1	44	71	1	1	1	57
9:00	1	1	60	50	1	1	1	55
10:00	1	1	33	28	1	1	1	30
11:00	1	1	36	32	1	1	1	34
12:00 PM	1	1	43	48	1	1	1	45
1:00	1	1	41	1	1	1	1	41
2:00	1	1	51	1	1	1	1	51
3:00	1	1	39	1	1	1	1	39
4:00	1	59	46	1	1	1	1	52
5:00	1	67	43	1	1	1	1	54
6:00	1	60	56	1	1	1	1	58
7:00	1	39	29	1	1	1	1	33
8:00	1	44	40	1	1	1	1	42
9:00	1	35	30	1	1	1	1	32
10:00	1	27	17	1	1	1	1	21
11:00	1	27	15	1	1	1	1	21
TOTALS	1	358	696	283	1	1	1	724

SITE CODE : 00002415

PAGE: 1

Location : CABOT/BET.CENTRE ST. & BLAKE

FILE: CABOTST

Weather :

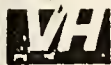
Operator : VAN /GR

DATE: 4/24/89

TIME	MONDAY 24		TUESDAY 25		WEDNESDAY 26		THURSDAY 27		FRIDAY 28		SATURDAY 29		SUNDAY 30		WEEK AVERAGE	
BEGIN	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2	Ch 1	Ch 2
12:00 AM	1	1	2	2	13	6	13	6	0	0	0	0	0	0	4	2
1:00	1	1	3	2	5	3	9	1	0	0	0	0	0	0	2	1
2:00	1	1	0	0	3	2	6	6	0	0	0	0	0	0	1	1
3:00	1	1	0	0	2	0	2	0	0	0	0	0	0	0	0	0
4:00	1	1	1	2	1	1	3	0	0	0	0	0	0	0	0	0
5:00	1	1	10	7	4	8	2	7	0	0	0	0	0	0	2	3
6:00	1	1	15	41	16	54	17	36	0	0	0	0	0	0	6	21
7:00	1	1	78	177	73	153	75	170	0	0	0	0	0	0	37	83
8:00	1	1	97	261	101	260	105	218	0	0	0	0	0	0	50	123
9:00	1	1	82	102	60	91	78	120	0	0	0	0	0	0	36	52
10:00	1	1	60	97	67	94	72	86	0	0	0	0	0	0	33	46
11:00	1	1	82	81	72	87	80	86	0	0	0	0	0	0	39	42
12:00 PM	80	91	104	113	108	105	88	95	0	0	0	0	0	0	54	57
1:00	85	76	93	131	88	93	99	127	0	0	0	0	0	0	52	61
2:00	87	123	128	122	99	97	114	146	0	0	0	0	0	0	61	69
3:00	126	130	111	141	126	147	15	14	0	0	0	0	0	0	54	61
4:00	127	139	137	140	134	141	0	0	0	0	0	0	0	0	56	60
5:00	163	170	148	149	151	193	0	0	0	0	0	0	0	0	66	73
6:00	143	128	154	157	156	172	0	0	0	0	0	0	0	0	64	65
7:00	98	111	99	113	107	147	0	0	0	0	0	0	0	0	43	53
8:00	100	90	91	74	86	70	0	0	0	0	0	0	0	0	39	33
9:00	53	57	65	62	70	55	0	0	0	0	0	0	0	0	26	24
10:00	36	41	36	30	35	29	0	0	0	0	0	0	0	0	15	14
11:00	27	14	27	13	19	24	0	0	0	0	0	0	0	0	10	7
TOTALS	1125	1170	1623	2017	1596	2032	778	1118	0	0	0	0	0	0	752	951

COMBINED TOTALS

12:00 AM	1	4	19	19	0	0	0	6
1:00	1	5	8	10	0	0	0	3
2:00	1	0	5	12	0	0	0	2
3:00	1	0	2	2	0	0	0	0
4:00	1	3	2	3	0	0	0	0
5:00	1	17	12	9	0	0	0	5
6:00	1	56	70	53	0	0	0	29
7:00	1	255	226	245	0	0	0	120
8:00	1	358	361	323	0	0	0	173
9:00	1	184	151	198	0	0	0	88
10:00	1	157	161	156	0	0	0	79
11:00	1	163	159	166	0	0	0	81
12:00 PM	171	217	213	183	0	0	0	111
1:00	161	224	181	226	0	0	0	113
2:00	210	250	196	260	0	0	0	130
3:00	256	252	273	29	0	0	0	115
4:00	266	277	275	0	0	0	0	116
5:00	333	297	344	0	0	0	0	139
6:00	271	311	328	0	0	0	0	129
7:00	209	212	254	0	0	0	0	96
8:00	190	165	156	0	0	0	0	72
9:00	110	127	125	0	0	0	0	50
10:00	77	66	64	0	0	0	0	29
11:00	41	40	43	0	0	0	0	17
TOTALS	2295	3640	3628	1896	0	0	0	1703

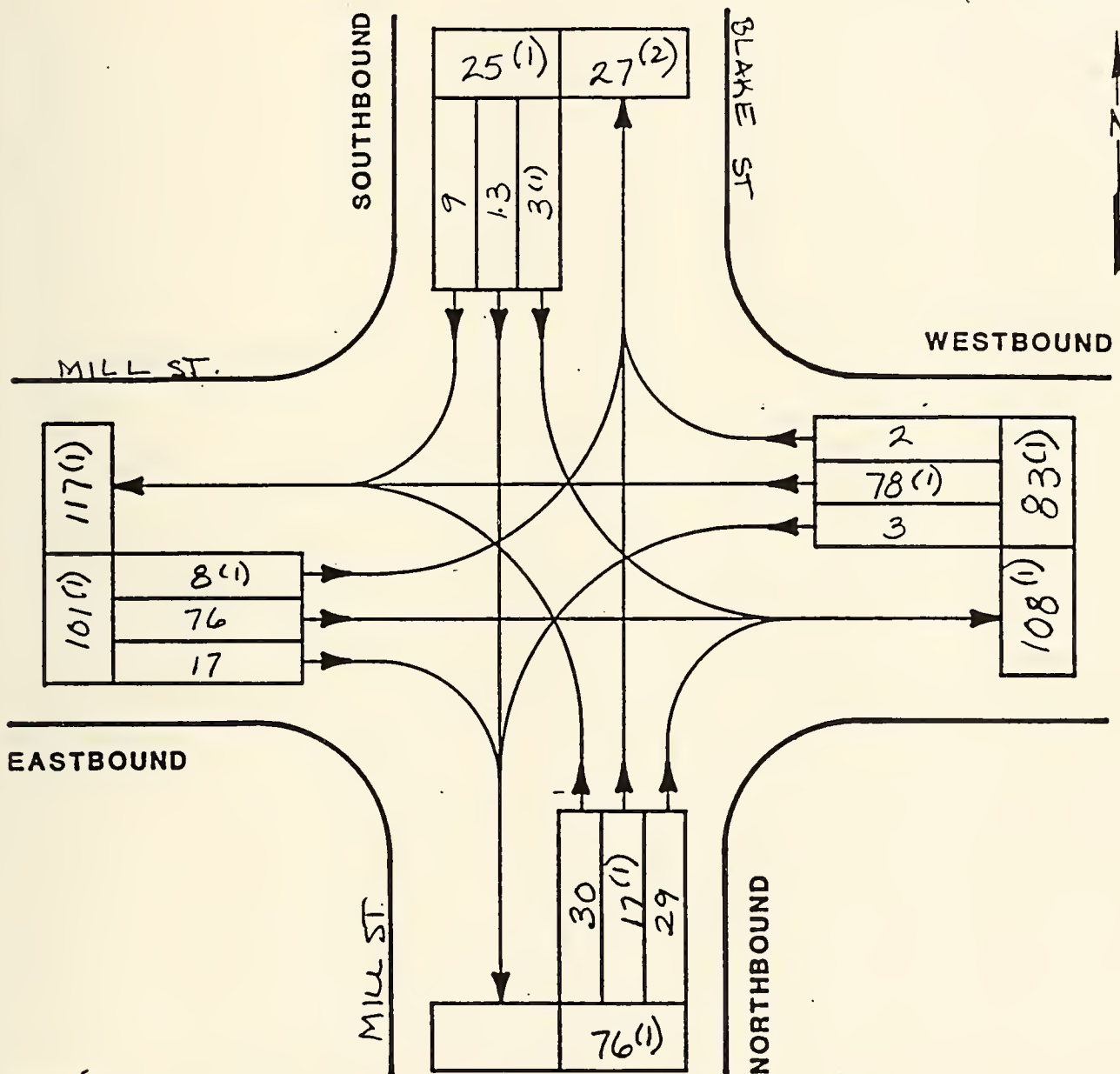


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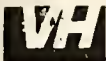
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INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON DATE 5/2/89 DAY of WEEK TUES
INTERSECTION MILL/CEDAR/BLAKE JOB No. 2415
CALCULATED BY: mf



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = <u>700 - 900</u>
<u>CEDAR ST NB</u>	<u>76(1)</u>		<u>AM</u> PEAK HOUR: = <u>745-845</u>
<u>BLAKE ST SB</u>	<u>25(1)</u>		
<u>MILL ST EB</u>	<u>101(1)</u>		P.H.F. = <u>0.78</u>
<u>MILL ST WB</u>	<u>83(1)</u>		
			VEHICLES COUNTED
			ALL VEHICLES <u>XXX</u> <u>285</u>
			TRUCKS <u>(XX)</u> <u>4</u>
TOTAL	<u>285(4)</u>		PERCENT TRUCKS <u>1.4 %</u>

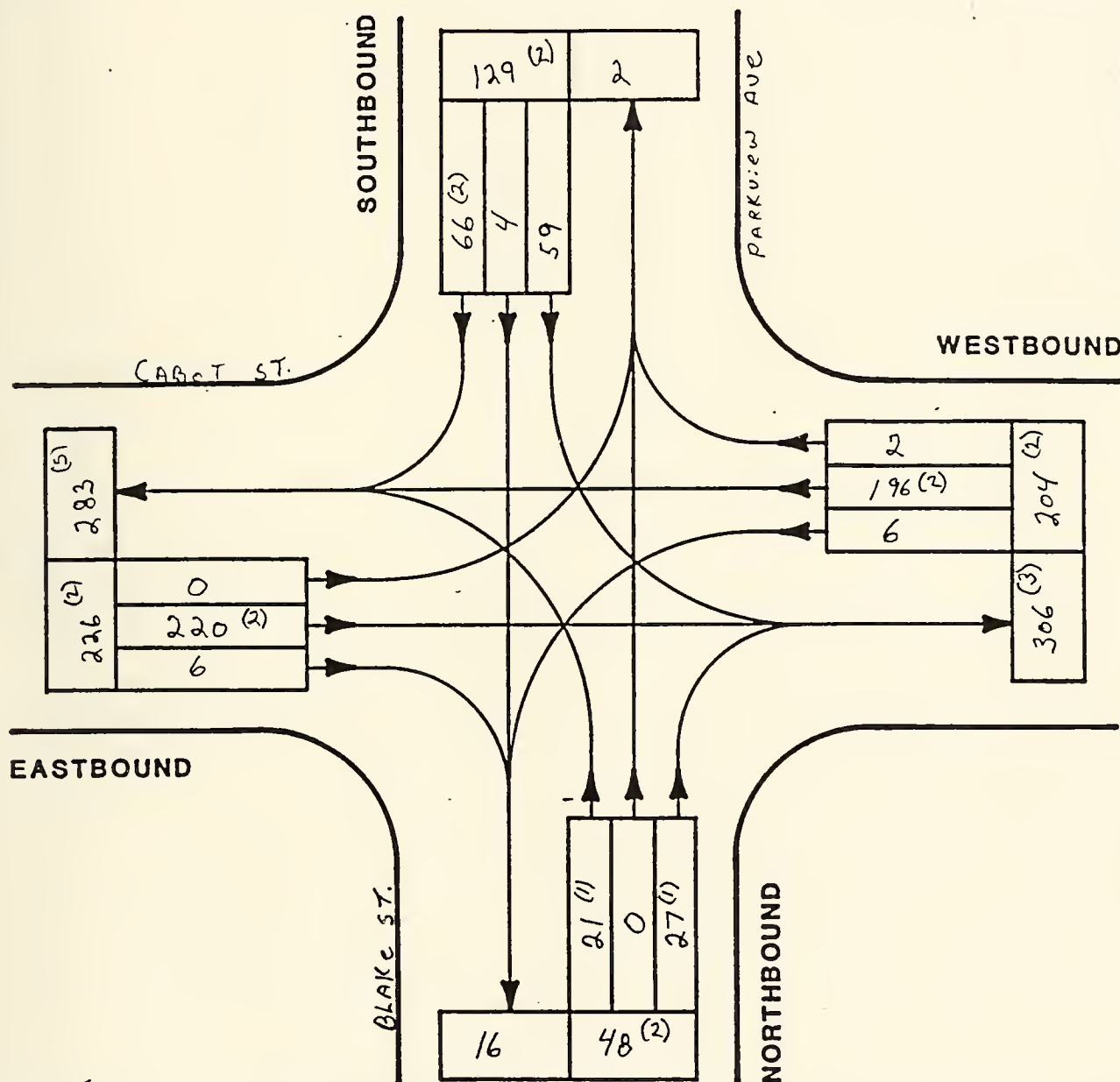


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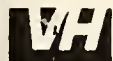
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INTERSECTION TURNING MOVEMENT COUNT

CITY Newton MASS DATE 5-2-89 DAY of WEEK Tues
INTERSECTION BLAKE ST. / CABOT ST. JOB No. 2415
CALCULATED BY: G.R.



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = 0700 - 0900
CABOT ST. EB	226 (2)	37%	(AM) PEAK HOUR: = 0745-0845 P.H.F. = .88%
CABOT ST. WB	204 (2)	34%	
BLAKE ST. NB	48 (2)	8%	
PARKVIEW AVE SB	129 (2)	21%	
			VEHICLES COUNTED
			ALL VEHICLES XXX 607
			TRUCKS (XX) 8
TOTAL	607 (8)	100%	PERCENT TRUCKS 1.3 %

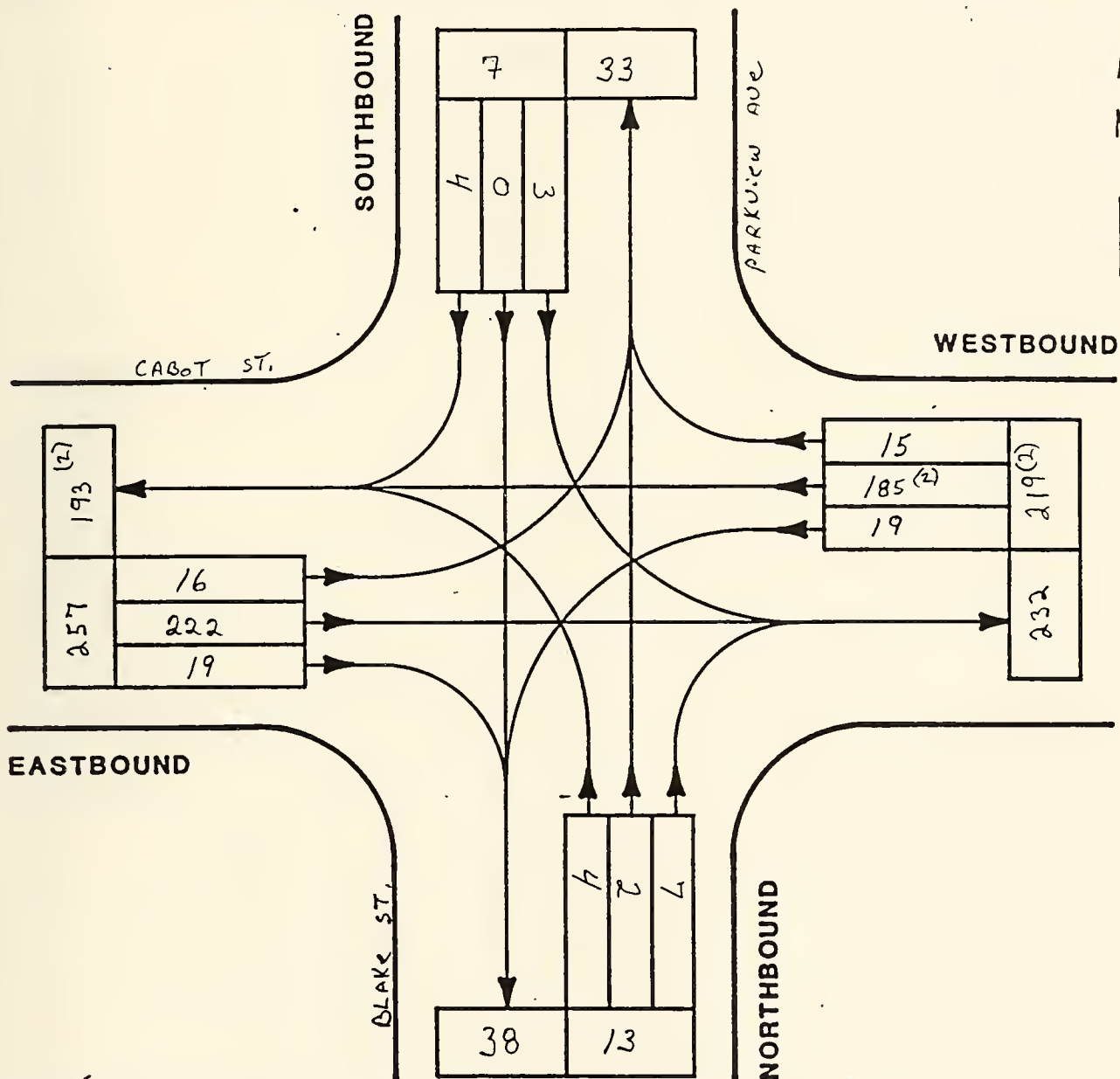


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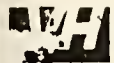
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INTERSECTION TURNING MOVEMENT COUNT

CITY Newton MASS DATE 5-1 DAY of WEEK mon
INTERSECTION Blake St. / Cabot St. JOB No. 2415
CALCULATED BY: G.R.



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = <u>1600</u> - <u>1800</u>
CABOT ST. EB	257	52%	AM
CABOT ST. WB	219 (2)	44%	(PM) PEAK HOUR: = 1700-1800
BLAKE ST. NB	13	3%	P.H.F. = .95%
PARKVIEW AVE. SB	7	1	
			VEHICLES COUNTED
			ALL VEHICLES XXX 496
			TRUCKS (XX) 2
TOTAL	496 (2)	100%	PERCENT TRUCKS 0.4 %



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INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON

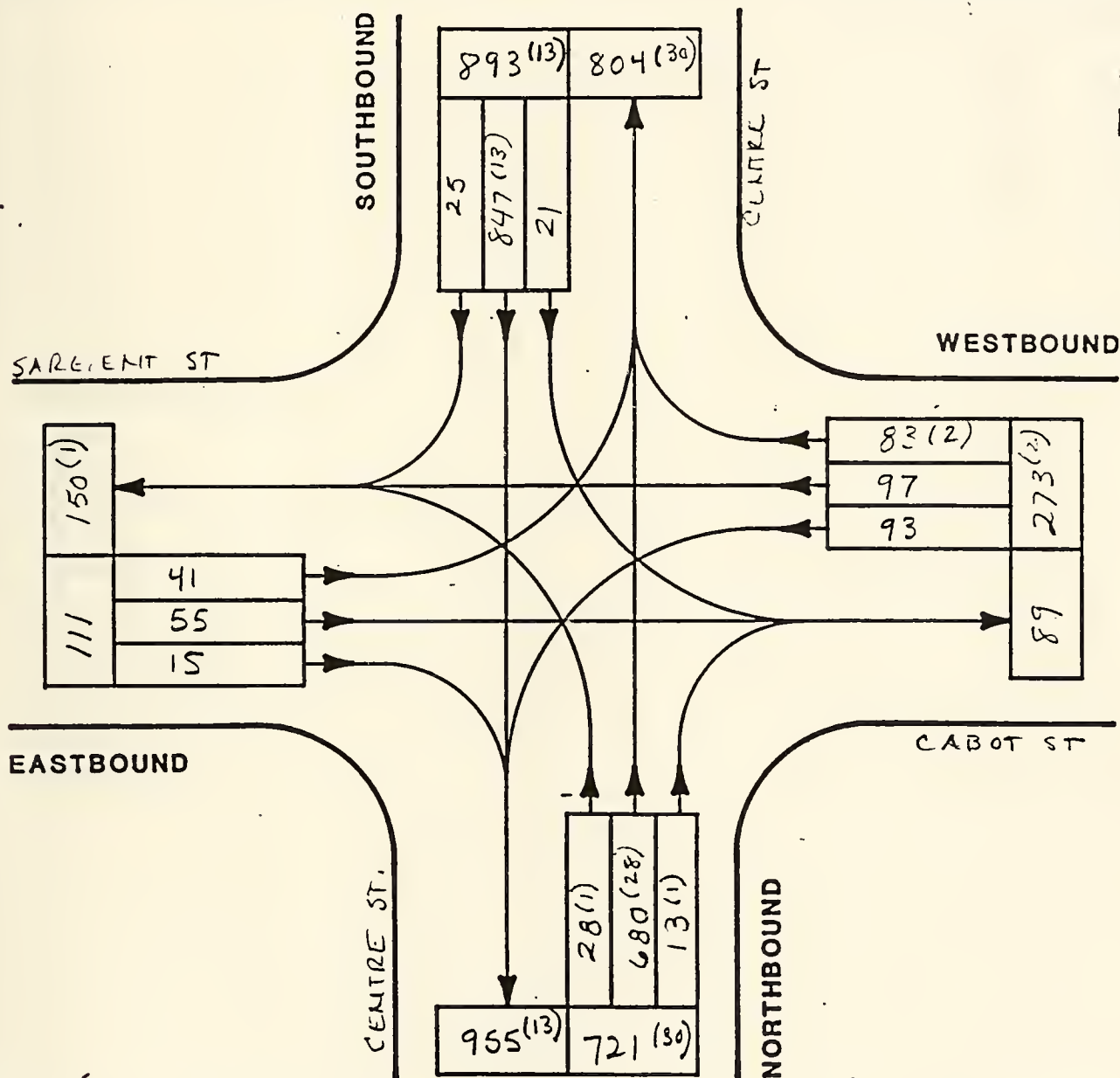
DATE 4/25

DAY of WEEK TUES

INTERSECTION CENTRE ST / CABOT ST / SARGENT ST.

JOB No. 2415

CALCULATED BY: mf



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = <u>7:00 - 9:00</u>
CENTRE ST NB	721 (30)	36%	AM PM PEAK HOUR: = 7.45 - 8.45
CENTRE ST SB	893 (13)	45%	
CABOT ST WB	273 (2)	14%	P.H.F. = 0.99
SARGENT ST EB	111	5%	
			VEHICLES COUNTED
			ALL VEHICLES XXX 1998
			TRUCKS (XX) 45
TOTAL	1998 (45)	100%	PERCENT TRUCKS 2.3 %



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INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON

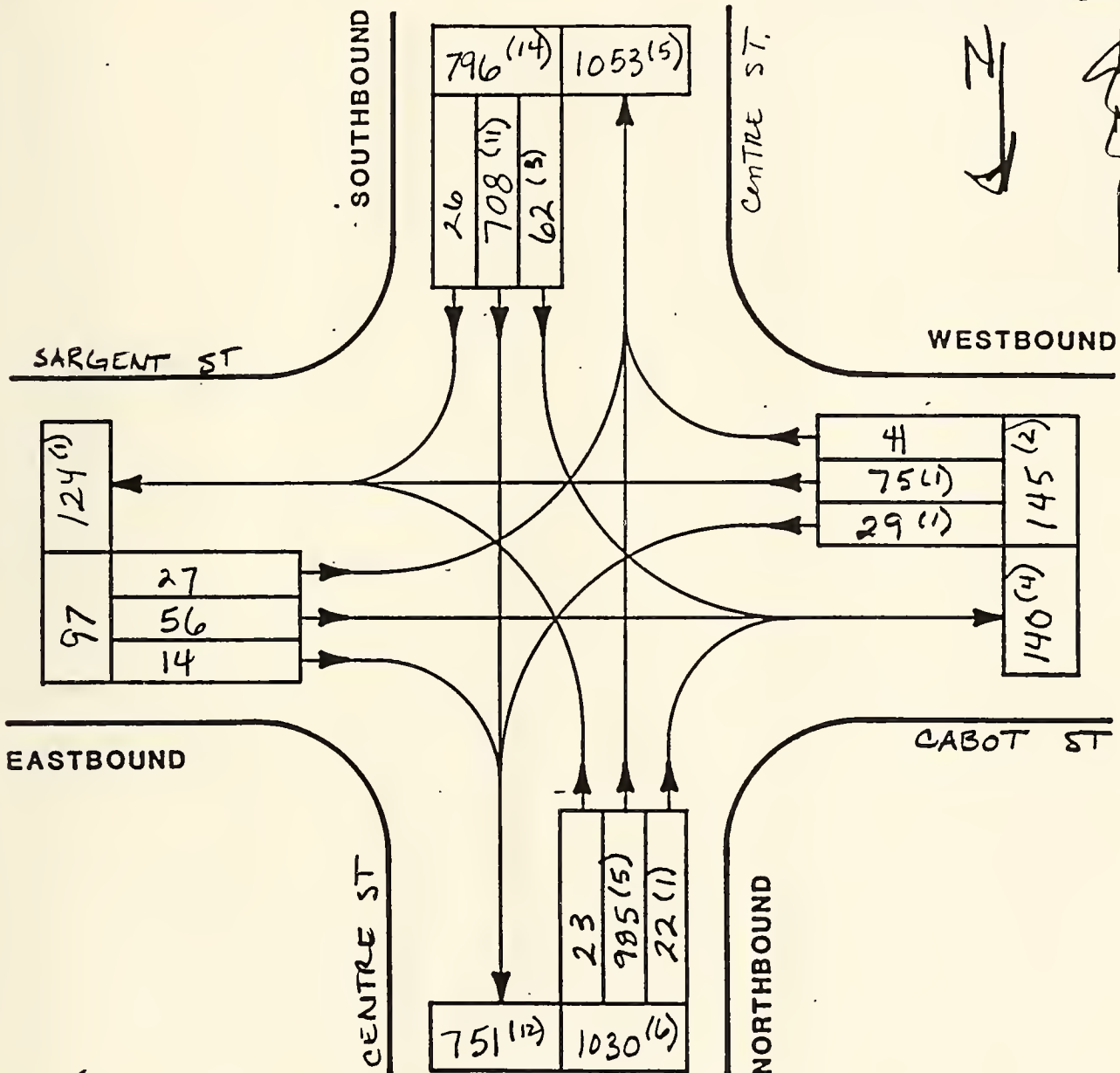
DATE 4/25/89

DAY of WEEK TUES

INTERSECTION CENTRE ST / CABOT ST / SARGENT ST

JOB No. 2415

CALCULATED BY: my



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = <u>1600</u> - <u>1800</u>
CENTRE ST NB	1030 (6)	50%	AM PM PEAK HOUR: = 1700-1800
CENTRE ST SB	796 (14)	38%	
CABOT ST WB	145 (2)	7%	P.H.F. = 0.92
SARGENT ST EB	97	5%	
			VEHICLES COUNTED
			ALL VEHICLES XXX 2068
			TRUCKS (XX) 22
TOTAL	2068 (22)	100%	PERCENT TRUCKS 1.1 %





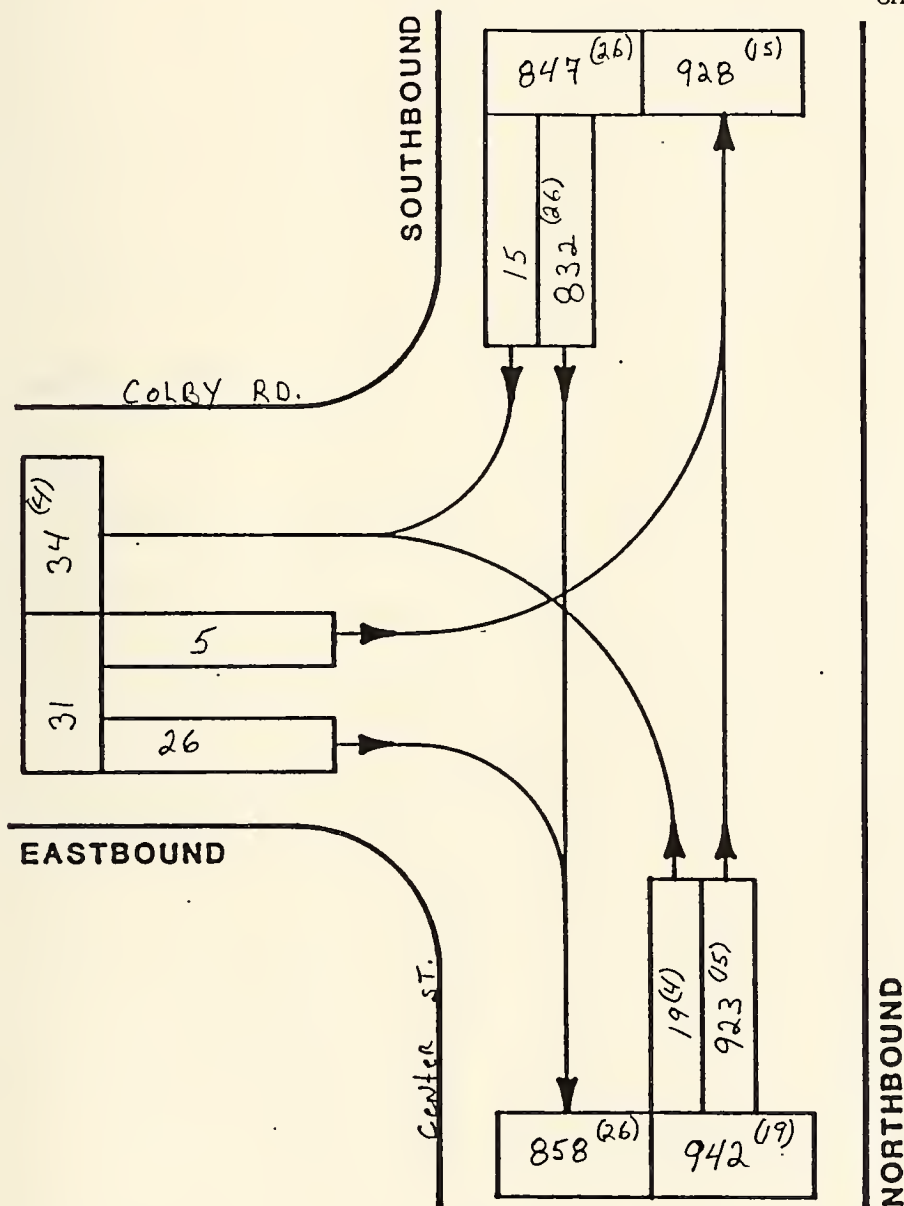
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INTERSECTION TURNING MOVEMENT COUNT

CITY Newton MASS DATE 4-25 DAY of WEEK Tues.

INTERSECTION COLBY RD. / Center ST. JOB No. 2415

CALCULATED BY: GR.



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = 0700 - 0900
Center ST. NB	942 (49)	52%	(AM) PEAK HOUR: = 0800-0900
Center ST. SB	847 (26)	46%	
COLBY RD. EB	31	2%	P.H.F. = .97%
			VEHICLES COUNTED
			ALL VEHICLES XXX 1820
			TRUCKS (XX) 45
TOTAL	1820 (45)	100%	PERCENT TRUCKS 2.5 %

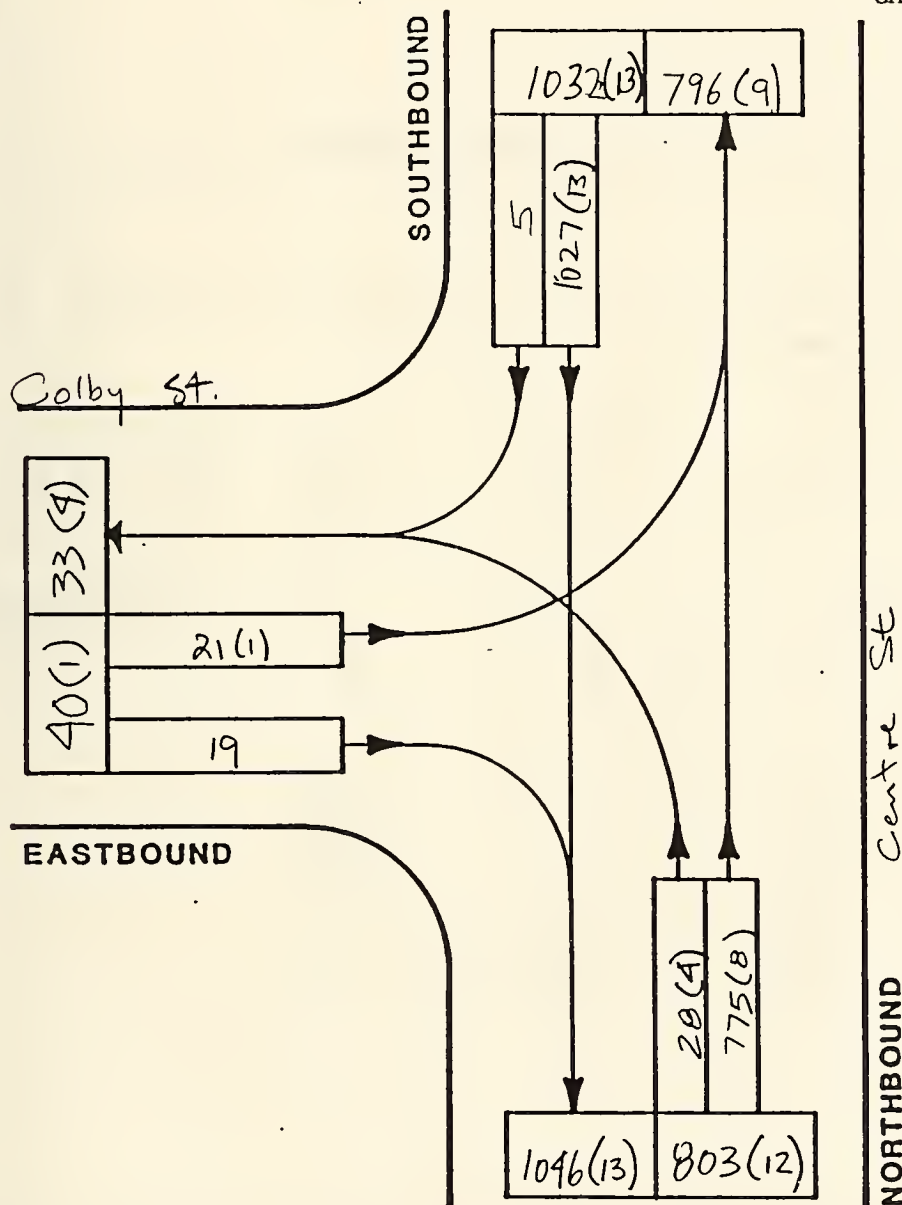


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INTERSECTION TURNING MOVEMENT COUNT

CITY Newton Ma DATE 5/1/89 DAY of WEEK Monday
INTERSECTION Centre st & Colby St JOB No. 2415

CALCULATED BY: SES



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = <u>16⁰⁰ - 18⁰⁰</u>
CENTRE ST NB	803 (12)	43%	AM
CENTRE ST SB	1032 (13)	55%	PM
COLBY ST EB	40 (1)	2%	
			P.H.F. = 0.89
			VEHICLES COUNTED
			ALL VEHICLES XXX 1875
			TRUCKS (XX) 26
TOTAL	1875 (26)	100%	PERCENT TRUCKS 1.4 %

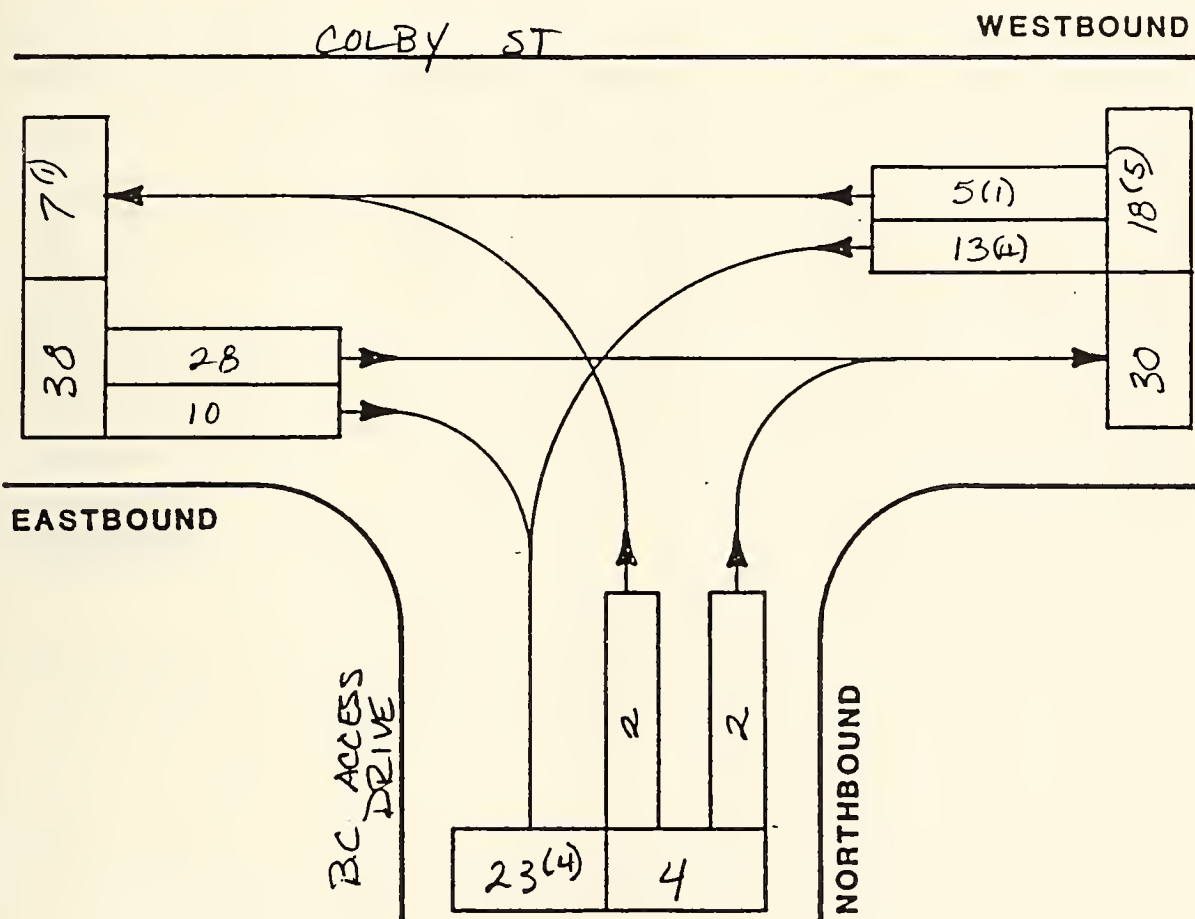


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INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON DATE 5/2/89 DAY of WEEK TUES.
INTERSECTION COLBY ST / B.C. ACCESS DR. JOB No. 2415
CALCULATED BY: MT



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = <u>700 - 900</u>
COLBY ST EB	38	63%	AM PEAK HOUR: = 800 - 900
COLBY ST WB	18(5)	30%	PM
BC ACCESS DR NB	4	6%	P.H.F. = 0.71
			VEHICLES COUNTED
			ALL VEHICLES XXX 60
			TRUCKS (XX) 5
TOTAL	60(5)	100%	PERCENT TRUCKS 8.3 %



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INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON

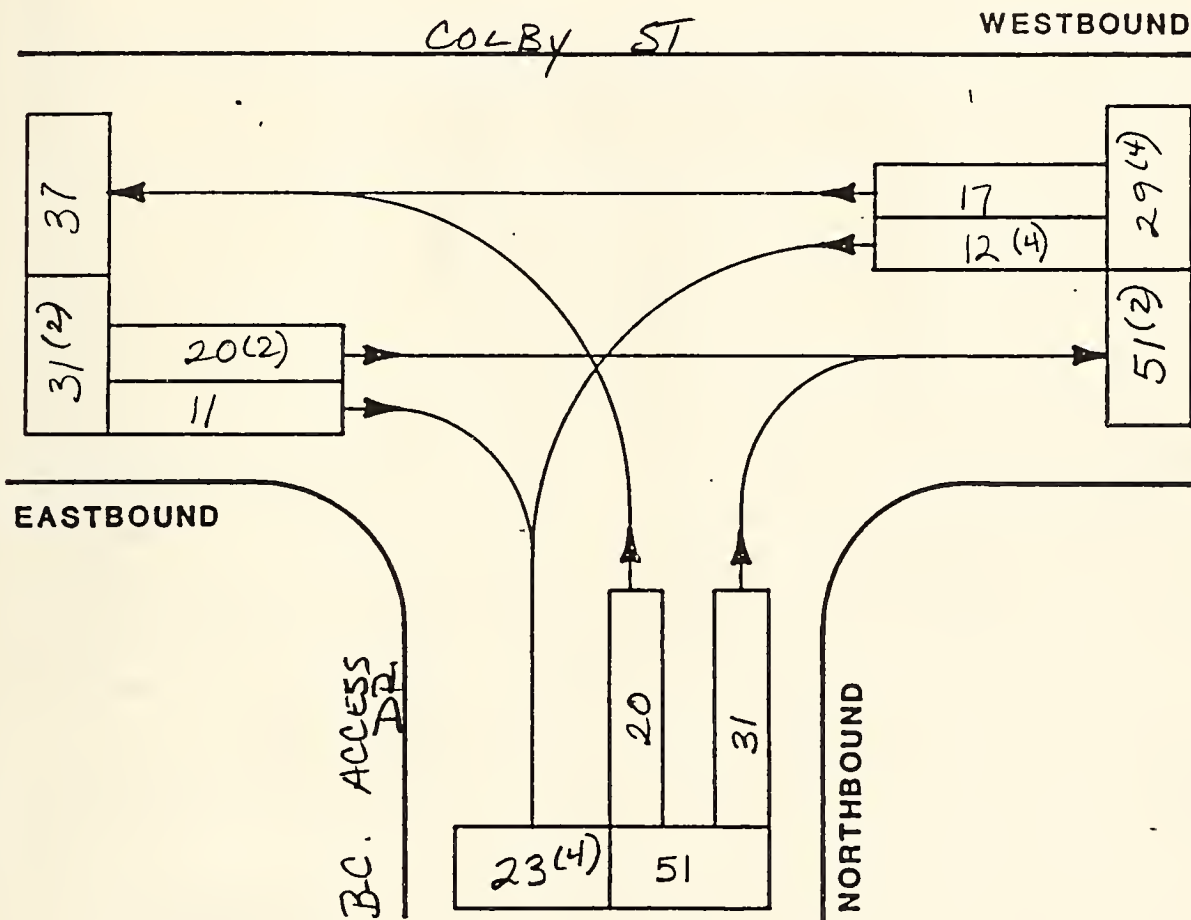
DATE 05/01/89

DAY of WEEK MON.

INTERSECTION COLBY ST / BC ACCESS DR.

JOB No. 2415

CALCULATED BY: mf



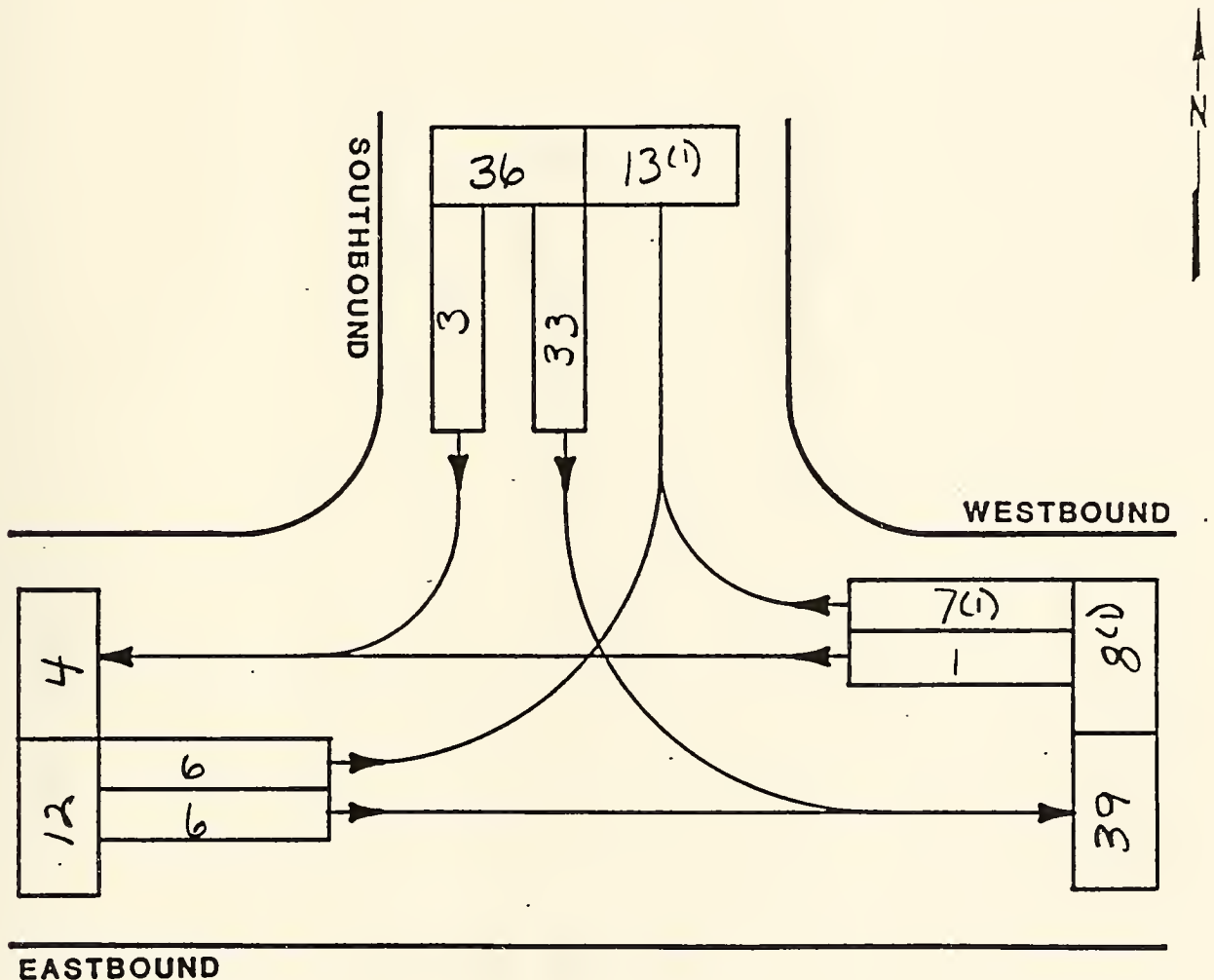
STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT <u>1600 - 1800</u>
BC ACCESS DR NB	51	46%	AM PEAK HOUR: = 1600-1700
COLBY ST EB	31 (2)	28%	PM
COLBY ST WB	29 (4)	26%	P.H.F. = 0.90
			VEHICLES COUNTED
			ALL VEHICLES XXX 111
			TRUCKS (XX) 6
TOTAL	111 (6)	100%	PERCENT TRUCKS 5.4 %



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INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON DATE 5/2/89 DAY of WEEK TUES
INTERSECTION COLBY ST / ROCHESTER ST JOB No. 2415
CALCULATED BY: MZ



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = <u>7⁰⁰ - 9⁰⁰</u>
COLBY ST EB	12	22%	AM
COLBY ST WB	8(1)	14%	PM
ROCHESTER ST SB	36	64%	
			P.H.F. = 0.87
			VEHICLES COUNTED
			ALL VEHICLES XXX 56
			TRUCKS (XX) 1
TOTAL	56(1)	100%	PERCENT TRUCKS 1.8 %





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INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON

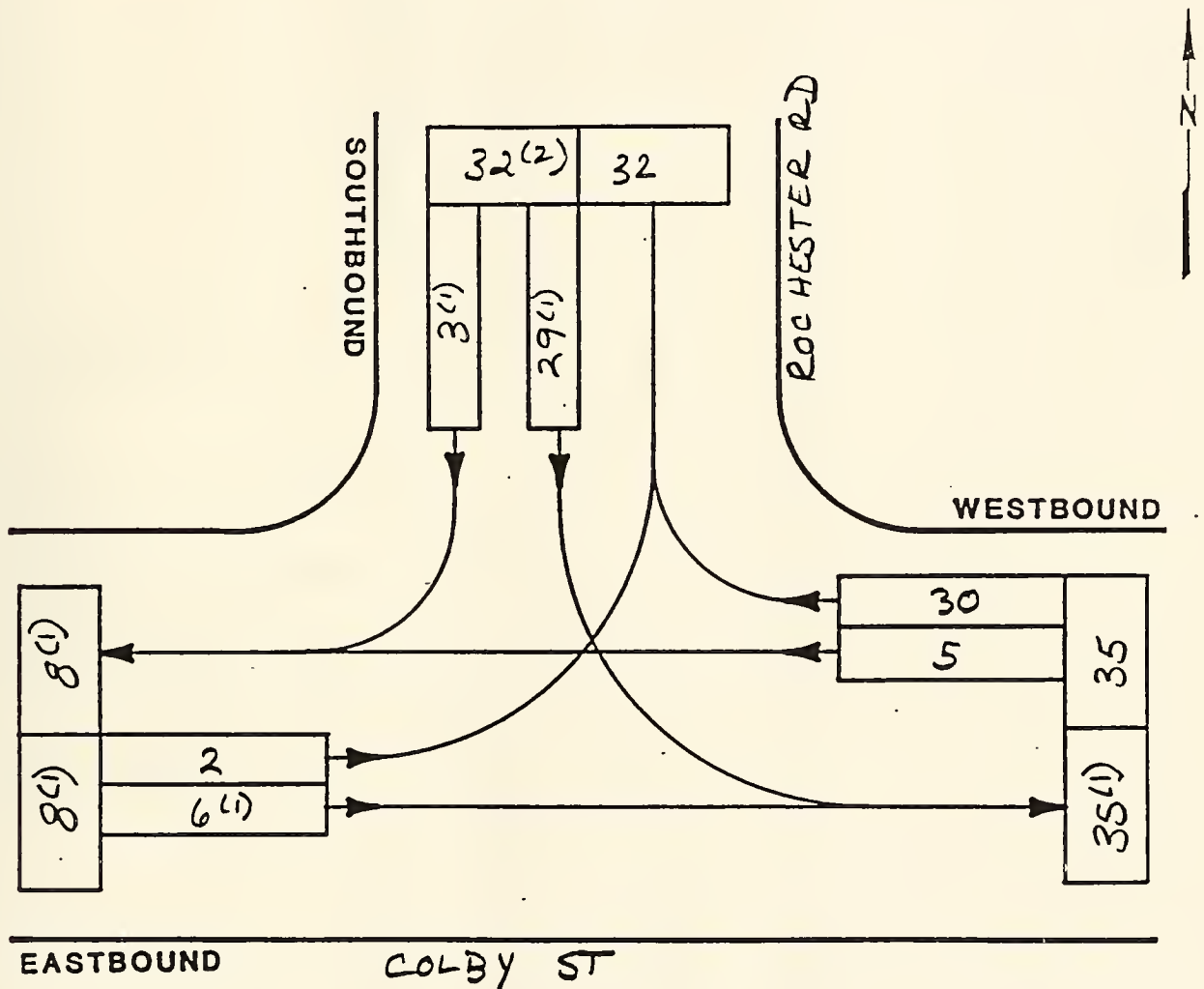
DATE 5/1/89

DAY of WEEK MON

INTERSECTION COLBY / ROCHESTER RD

JOB No. 2415

CALCULATED BY: mz



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = <u>1600</u> - <u>1800</u>
<u>COLBY ST EB</u>	<u>8(1)</u>	<u>10%</u>	AM
<u>COLBY ST WB</u>	<u>35</u>	<u>47%</u>	PM
<u>ROCHESTER ST SB</u>	<u>32(2)</u>	<u>43%</u>	
			P.H.F. = <u>0.78</u>
			VEHICLES COUNTED
			ALL VEHICLES <u>XXX 75</u>
			TRUCKS <u>(XX) 3</u>
TOTAL	<u>75(3)</u>	<u>100%</u>	PERCENT TRUCKS <u>4.0 %</u>

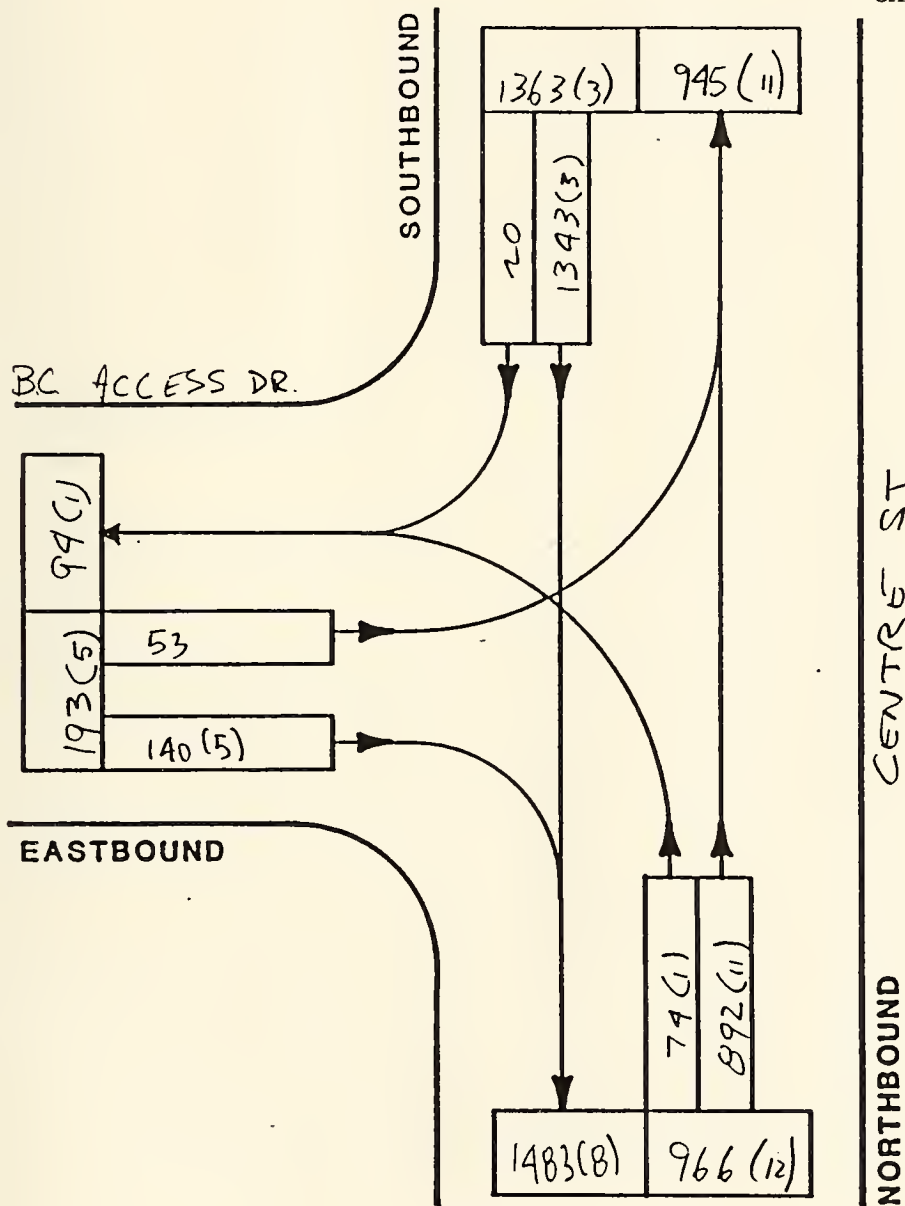


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INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON MASS DATE 9/25/89 DAY of WEEK TUESDAY
INTERSECTION CENTRE ST & BC ACCESS DR JOB No. 2415

CALCULATED BY: SES



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = 4:00 - 6:00
BC ACCESS DR EB	193(5)	7.8%	AM
CENTRE ST SB	1363(3)	53.7%	PM PEAK HOUR: = 5:00 - 6:00
CENTRE ST NB	966(12)	38.5%	P.H.F. = 0.93
			VEHICLES COUNTED
			ALL VEHICLES XXX 2542
			TRUCKS (XX) 20
TOTAL	2522(20)	100%	PERCENT TRUCKS 0.8 %

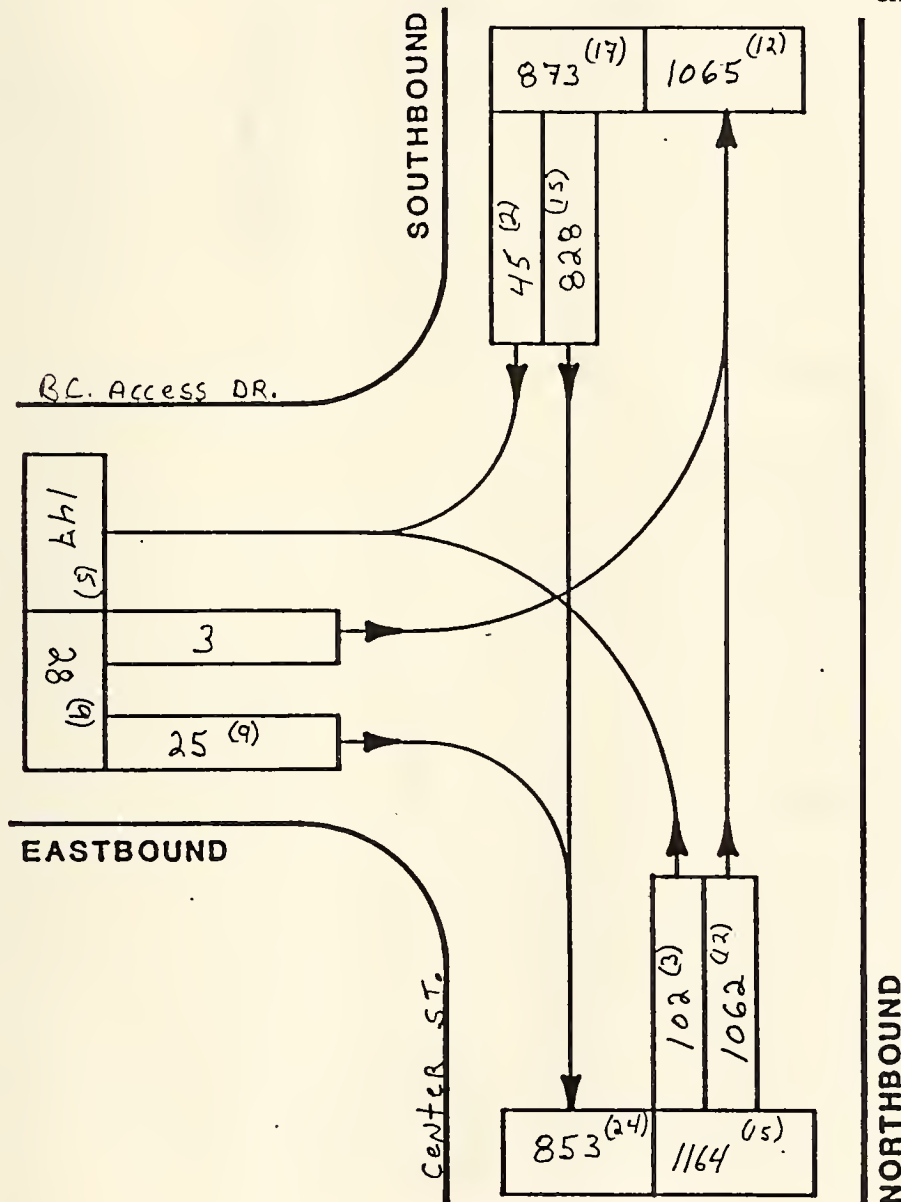


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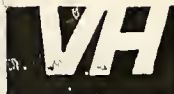
INTERSECTION TURNING MOVEMENT COUNT

CITY Newton MASS DATE 4-25-89 DAY of WEEK Tues.
INTERSECTION Center ST w/ B.C. Access DR. JOB No. 2415

CALCULATED BY: G.R.



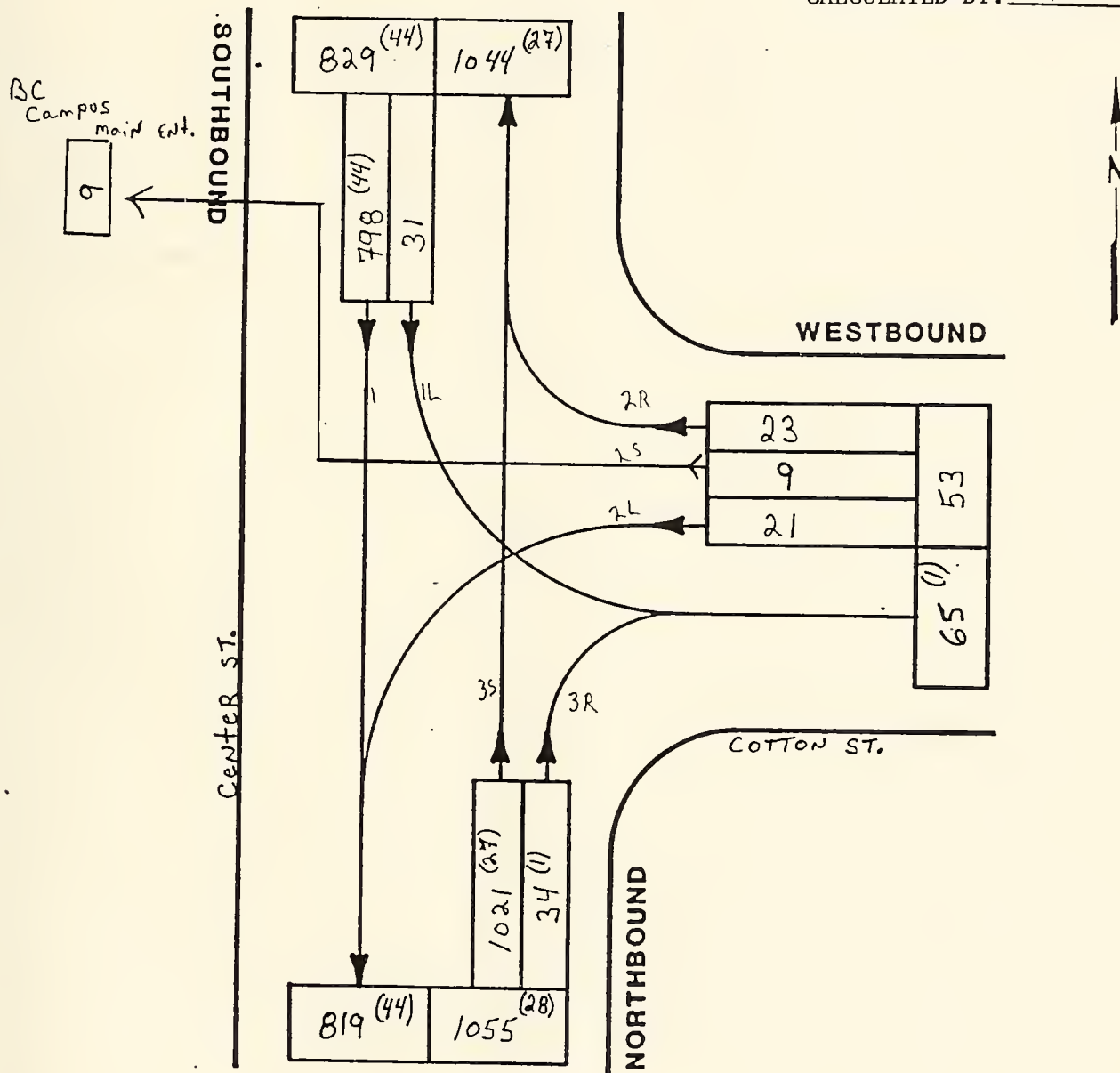
STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = 0700 - 0900
Center ST. NB	1164 (65)	57%	(AM) PM PEAK HOUR: = 0745-0845
Center ST. SB	873 (17)	42%	
B.C. Access DR. EB	28 (9)	1%	
			P.H.F. = .96%
			VEHICLES COUNTED
			ALL VEHICLES XXX 2065
			TRUCKS (XX) 41
TOTAL	2065 (41)	100%	PERCENT TRUCKS 2.0 %



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INTERSECTION TURNING MOVEMENT COUNT

CITY Newton MASS DATE 4-25-89 DAY of WEEK Tues
INTERSECTION Center St. / Cotton St. JOB No. 2415
CALCULATED BY: G.R.



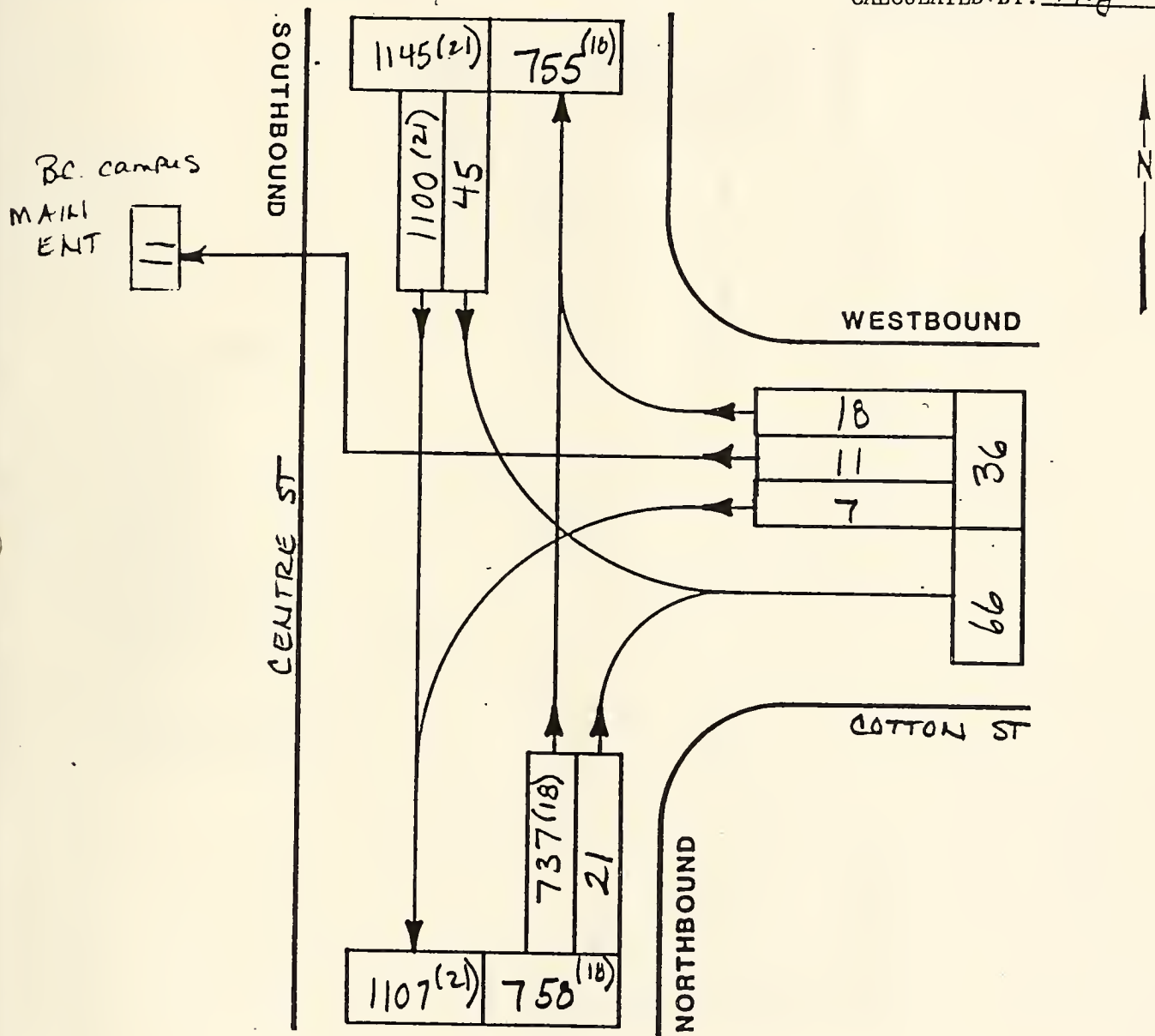
STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = 0700 - 0900
Center St. NB	1055 (28)	54 %	AM PEAK HOUR: = 0745-0845
Center St. SB	829 (44)	43 %	PM
Cotton St. WB	53	3 %	P.H.F. = .92 %
			VEHICLES COUNTED
			ALL VEHICLES XXX 1937
			TRUCKS (XX) 37
TOTAL	1937 (72)	100 %	PERCENT TRUCKS 4.0 %



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INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON DATE 4/25/89 DAY of WEEK TUES
INTERSECTION CENTRE ST / COTTON ST JOB No. 2415
CALCULATED BY: MJ



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = 1600 - 1800
CENTRE ST NB	758 (18)	39%	AM
CENTRE ST SB	1145 (21)	59%	PM
COTTON ST WB	36	2%	
			P.H.F. = 0.93
			VEHICLES COUNTED
			ALL VEHICLES XXX 1939
			TRUCKS (XX) 39
TOTAL	1939 (39)	100%	PERCENT TRUCKS 2.0 %

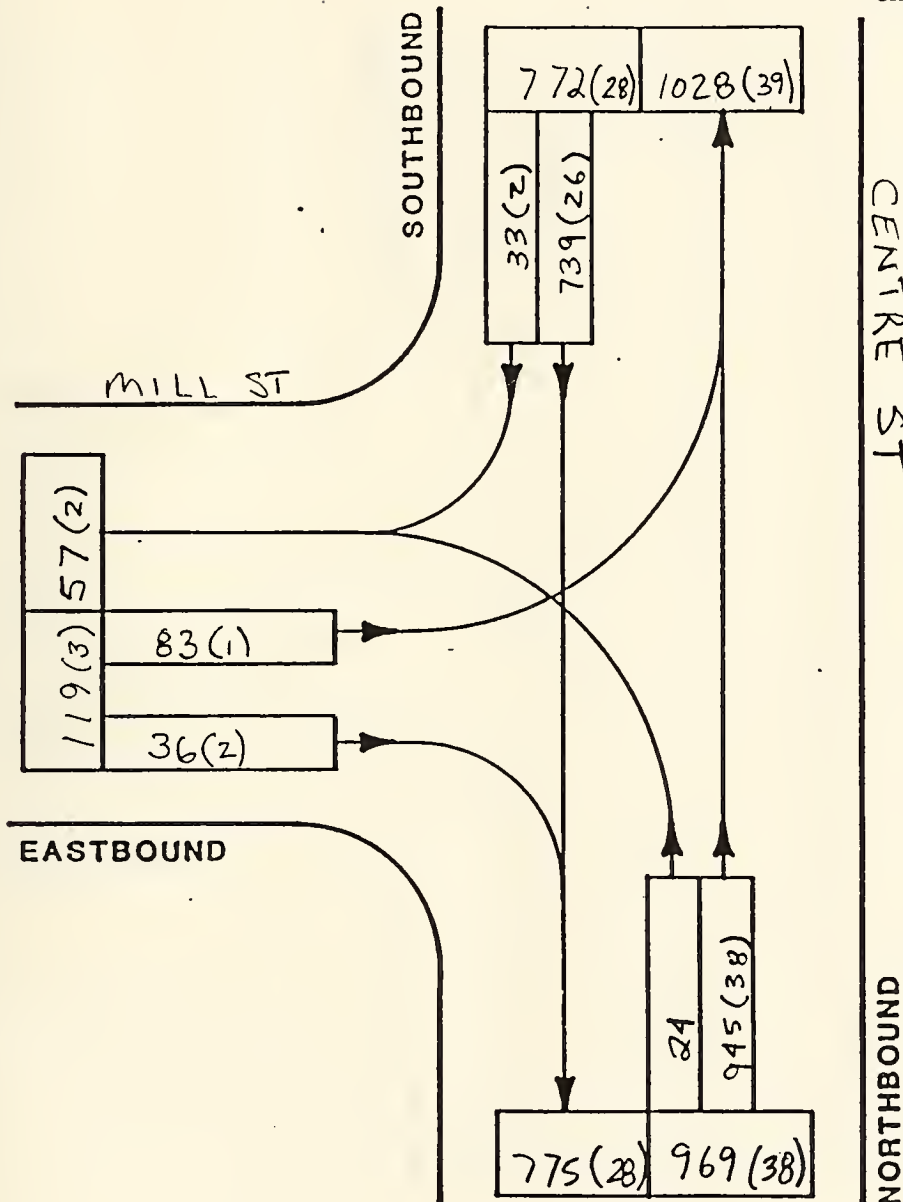


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INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON MA DATE 4/25/89 DAY of WEEK TUESDAY
INTERSECTION CENTRE ST & MILL ST JOB No. 2415

CALCULATED BY: SES



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = <u>7:00 - 9:00</u>
CENTRE ST NB	969(38)	52.2%	<u>AM</u> PEAK HOUR: = 7:45-8:45
CENTRE ST SB	772(28)	41.5%	PM
MILL ST EB	119(3)	6.3%	P.H.F. = 0.94
			VEHICLES COUNTED
			ALL VEHICLES XXX 1860
			TRUCKS (XX) 69
TOTAL	1860(69)	100%	PERCENT TRUCKS 3.7 %

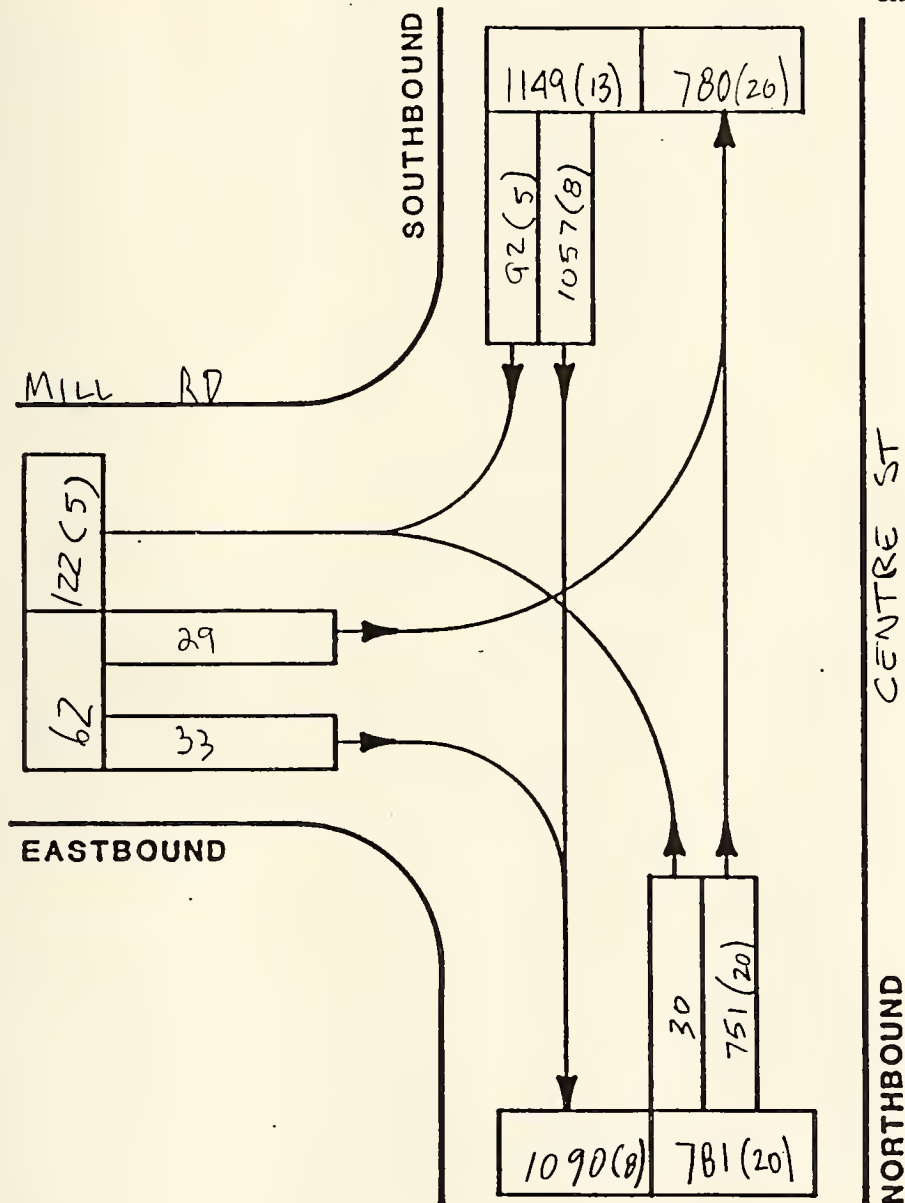


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INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON MASS DATE 4/25/89 DAY of WEEK TUESDAY
INTERSECTION CENTRE ST & MILL RD JOB No. 2415

CALCULATED BY: SES



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = <u>1600</u> - <u>1800</u>
MILL RD EB	62	3.1%	AM PM PEAK HOUR: = 1700-1800
CENTRE ST SB	1149(13)	57.4%	
CENTRE ST NB	781(20)	39.5%	
			P.H.F. = 0.98
			VEHICLES COUNTED
			ALL VEHICLES XXX 2025
			TRUCKS (XX) 33
TOTAL	1992(33)	100%	PERCENT TRUCKS 1.6 %



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INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON MASS

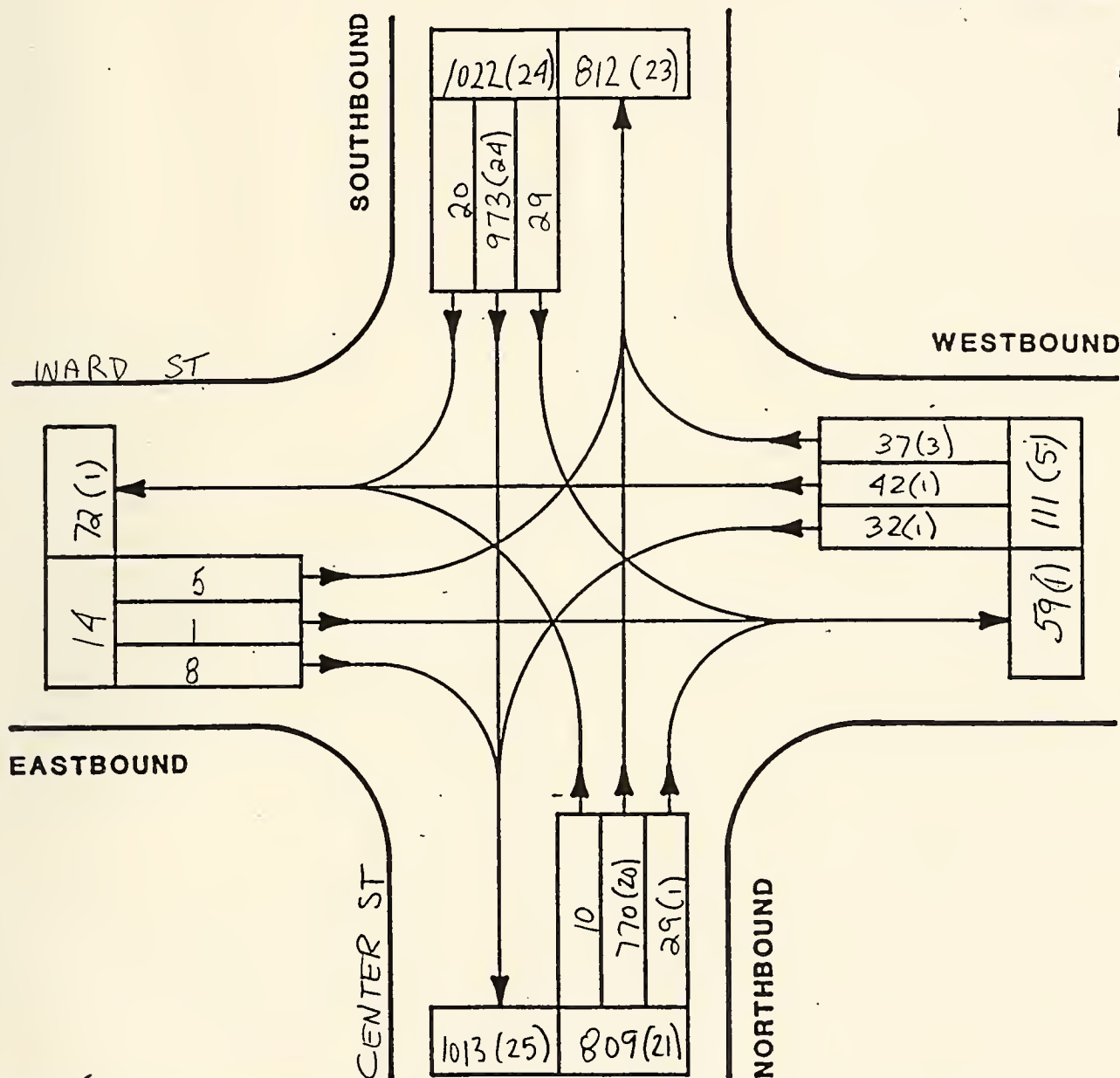
DATE _____

DAY of WEEK WEDNESDAY

INTERSECTION CENTRE ST & WARD ST

JOB No. 2415

CALCULATED BY: SES



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = <u>1600</u> - <u>1800</u>
WARD ST EB	14	0.7%	AM
CENTRE ST SB	1022 (24)	52.1%	PM
WARD ST WB	111 (5)	5.8%	PEAK HOUR: = 1700-1800
CENTRE ST NB	809 (21)	41.4%	P.H.F. = 0.96
			VEHICLES COUNTED
			ALL VEHICLES XXX 2006
			TRUCKS (XX) 50
TOTAL	1956 (50)	100%	PERCENT TRUCKS 2.5 %

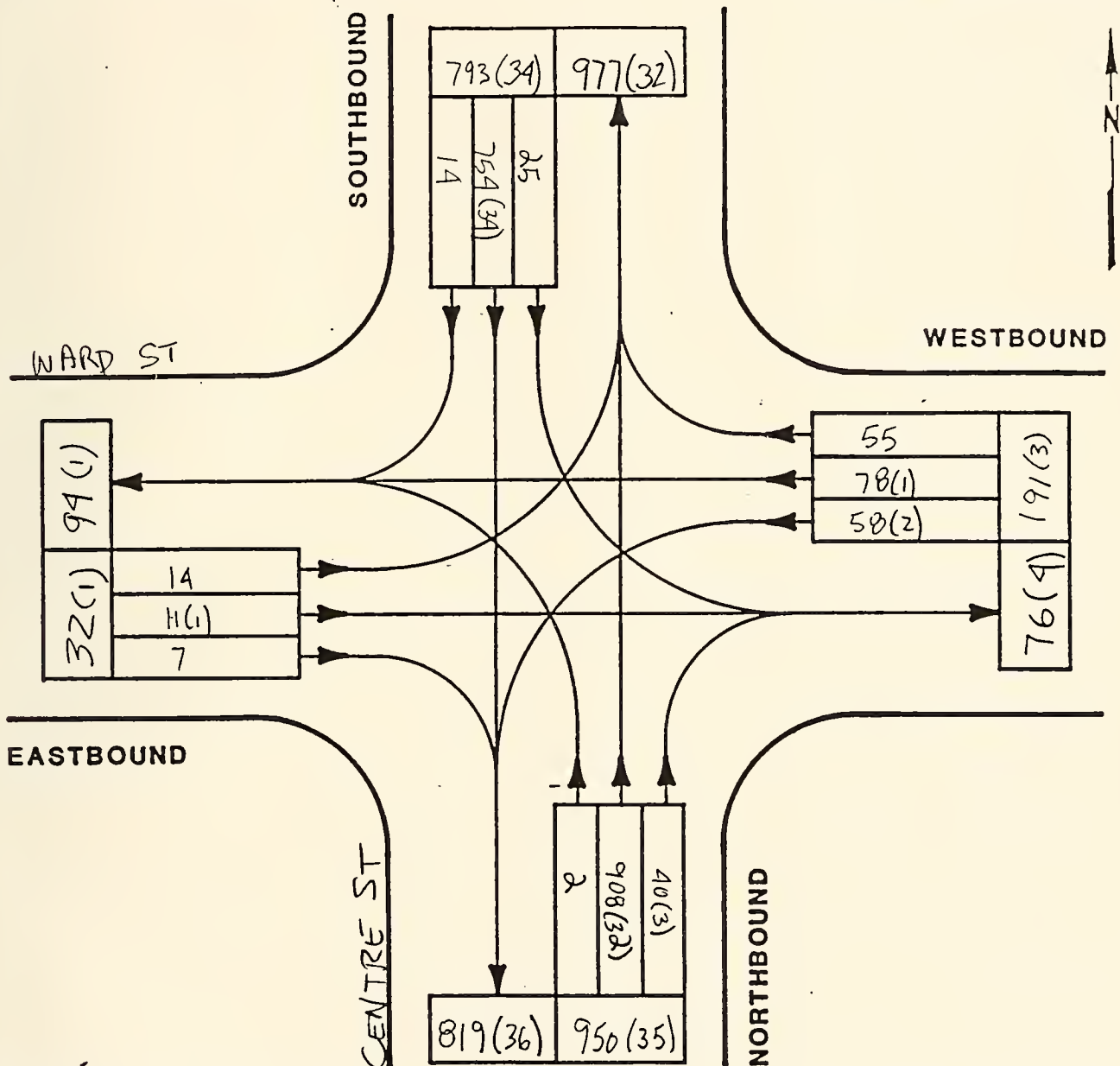


Vanasse Hangen Brustlin, Inc.
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Consulting Engineers
& Planners

INTERSECTION TURNING MOVEMENT COUNT

CITY NEWTON MASS DATE 9/26/89 DAY of WEEK WEDNESDAY
INTERSECTION CENTRE ST & WARD ST JOB No. 2415
CALCULATED BY: SES



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT = <u>7:00 - 9:00</u>
WARD ST EB	32 (1)	1.6 %	AM PM PEAK HOUR: = <u>8:00 - 9:00</u>
CENTRE ST SB	793 (34)	40.6 %	
WARD ST WB	191 (3)	9.5 %	P.H.F. = <u>0.96</u>
CENTRE ST NB	950 (35)	48.3 %	
			VEHICLES COUNTED
			ALL VEHICLES XXX <u>2039</u>
			TRUCKS (XX) <u>73</u>
TOTAL	1966 (73)	100 %	PERCENT TRUCKS <u>3.6 %</u>





